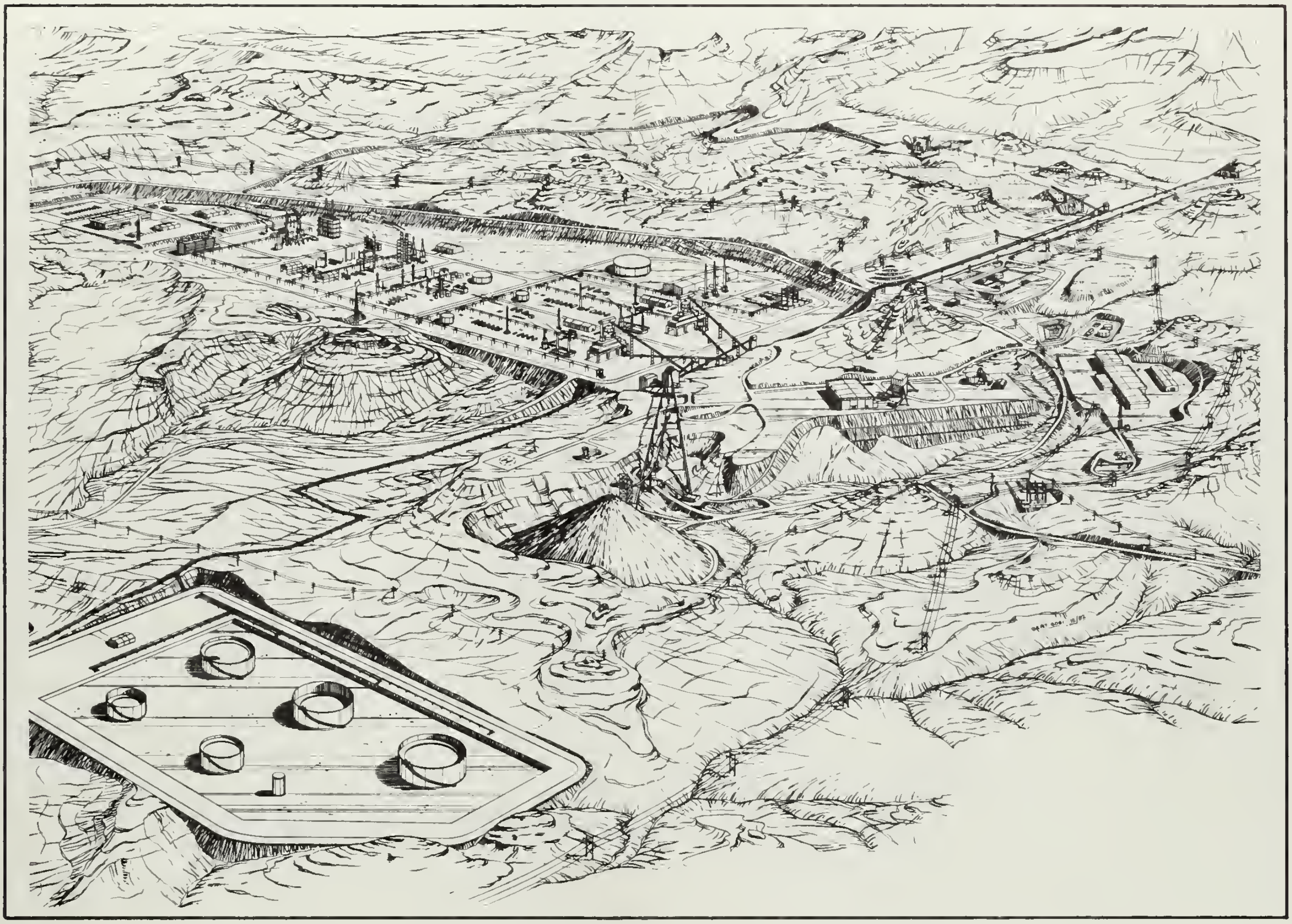
WHITE RIVER
SHALE OIL
CORPORATION



PHASE I
WHITE RIVER SHALE PROJECT
DRAFT SOURCE MONITORING PLAN OUTLINE

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SHALE OIL
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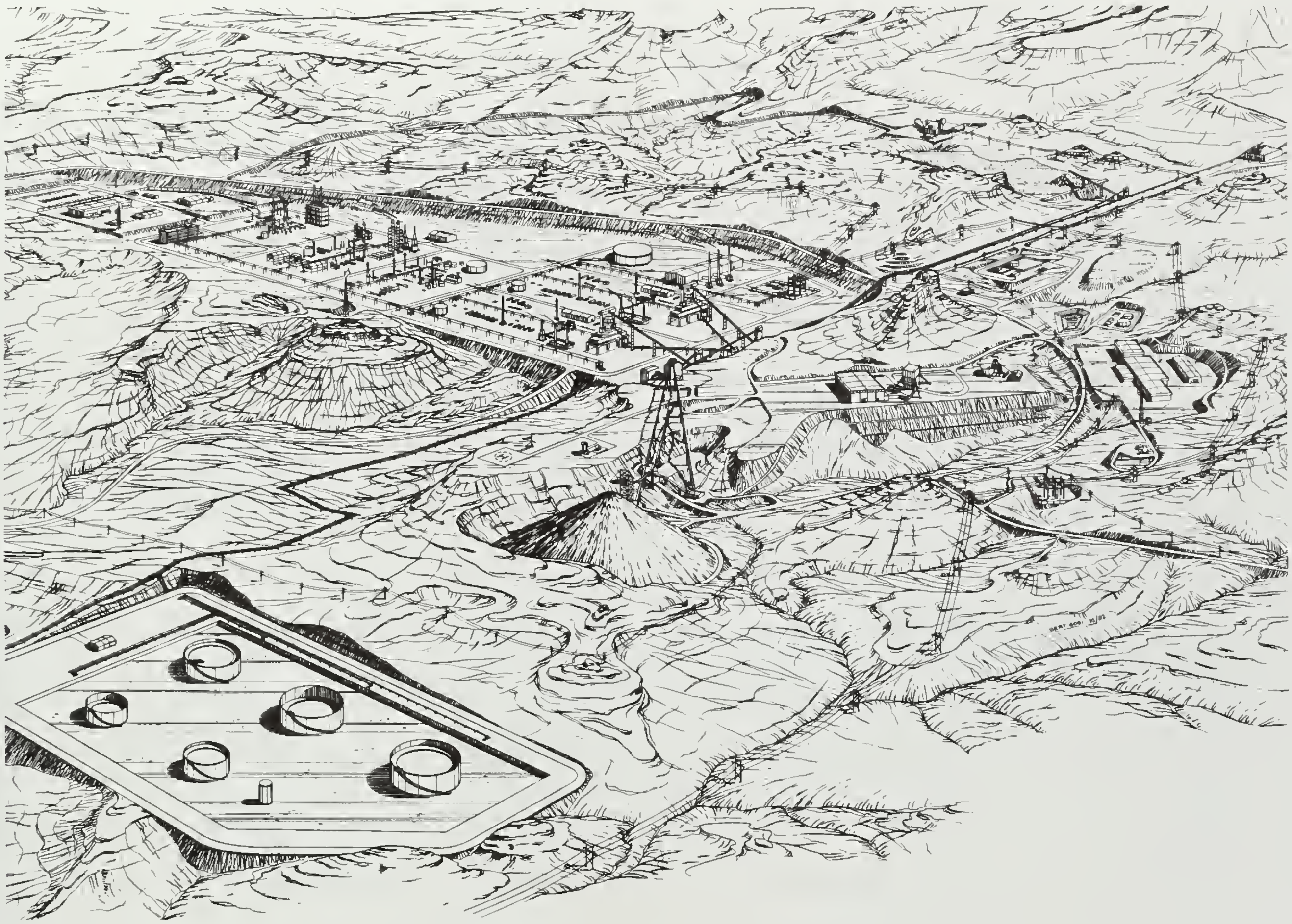


PHASE I
WHITE RIVER SHALE PROJECT
DRAFT SOURCE MONITORING PLAN OUTLINE

Submitted to
United States Synthetic Fuels Corporation

AUGUST 1983

Prepared by White River Shale Oil Corporation
115 South Main Street, Suite 500
Salt Lake City, Utah 84111

PREFACE

The White River Shale Project (WRSP) involves the development of Federal Prototype Oil Shale Lease Tracts Ua and Ub and associated Group 1 properties in northeastern Utah. The tracts were acquired in 1974 by the project sponsors - Phillips Petroleum Company, Sohio Shale Oil Company, and Sunoco Energy Development Co. The tracts are located in the eastern portion of the Uinta Basin of Uintah County, south of Bonanza and contiguous to the White River, which borders the tracts on the north. The White River Shale Oil Corporation (WRSOC) has been retained by the project sponsors to manage development of the WRSP.

The intent of the project sponsors is to develop the properties to produce commercial quantities of shale oil. The WRSP plans call for a staged development in three phases. Phase I comprises mining, oil shale retorting, and shale oil upgrading facilities designed to generate specific information on ore body characteristics, retorting and shale oil processes, and environmental protection. Up to 30,000 tons per day (tpd) of oil shale will be mined in this phase. Phase I is designed to produce approximately 16,500 barrels per stream day (bpsd) of upgraded shale oil.

Modified room-and-pillar underground techniques will be used at the WRSP to mine the oil shale. Mined shale will be crushed and screened to produce required size ranges. After crushing, the shale will be processed in surface retorts. Phase I will consist of two Unishale B retorts, the technology of which has been licensed

to the sponsors by Union Oil Company of California. The resultant shale oil will be upgraded onsite to a synthetic crude oil.

Phases II and III will involve expansion of shale oil production to levels of approximately 57,000 and 106,000 bpsd, respectively.

The owners have recently filed for financial assistance from the U.S. Synthetic Fuels Corporation (SFC) for Phase I of the WRSP. In accordance with Section 131e of the Energy Security Act, an Environmental Monitoring Plan Outline has been developed that addresses SFC's final Environmental Monitoring Plan Guidelines. The WRSP Environmental Monitoring Plan Outline consists of three separate documents: the Source Monitoring Plan Outline, the Health and Safety Monitoring Program Outline, and the Environmental Monitoring Manual, June 1982 (i.e., Ambient Monitoring Program). The three programs are interrelated and together form the basis for an Environmental Monitoring Plan that is intended to identify significant project impacts on the ambient environment and the health and safety of project workers.

Each program will monitor key environmental components or emissions that are important to each program area. The source program will monitor solid, liquid, and gaseous emissions at various points throughout the plant site. The ambient program will monitor vegetation, terrestrial and aquatic biology, surface and groundwater quality and hydrology, and air quality in the vicinity of the WRSP.

The occupational health and safety program will evaluate the effects of the project on employee health and provide data useful to a worker registry.

The Source Monitoring Plan Outline is separated into two separate tasks: Compliance Monitoring and Supplemental Monitoring. Compliance Monitoring addresses monitoring that is required by terms and conditions of permits and approvals or other regulatory obligations. To develop the Compliance Monitoring section of the Source Monitoring Plan Outline, it was often necessary to make assumptions concerning anticipated permit conditions. For this reason, as actual permit conditions are stipulated, the final form of the Compliance Monitoring Program could vary from the outline.

Supplemental Monitoring refers to any monitoring that is not required by permit approval conditions or regulatory obligations. The major goal of Supplemental Source Monitoring is to document the presence or absence of certain substances at concentrations that are suspected of causing carcinogenesis, mutagenesis, teratogenesis, reproductive effects, or other systemic disorders and environmental effects.

The proposed Supplemental Monitoring Program will use a two-phase approach to monitor unregulated pollutants. The first phase will emphasize a number of screening techniques to identify substances of potential environmental and health concern. These screening data will then be evaluated to determine the

scope of the routine Supplemental Monitoring Program that will constitute the second phase of the program. Only those waste streams that come in contact with the environment will be addressed in the Supplemental Monitoring Program.

The WRSP Health and Safety Monitoring Program Outline is separated into two distinct programs: an Occupational Safety Program that involves the establishment of criteria to prevent personal injury from moving equipment, hot vessels, etc., and a Health Monitoring Program that will be designed primarily to monitor and record the status of employee health relative to routine or episodic exposures to significant compounds at the WRSP. The health program will also document and quantify occupational exposures to significant unregulated substances that may be encountered during such processes as oil shale mining, shale processing, shale oil upgrading, and disposal of processed shale and wastewaters.

The WRSP has developed and is currently implementing a detailed ambient monitoring program that will track the impacts of project development, evaluate success of planned mitigation measures, and provide feedback to design and operations to minimize any identified environmental effects. The ambient program is described in the WRSP Environmental Monitoring Manual. The ambient monitoring program is the product of 9 years of continuous field monitoring (1974-1983) at the project site, during which time the environment was characterized, coupled with a careful evaluation of probable impacts expected from the current tract development plan.

The Environmental Monitoring Manual was prepared in 1982 in consultation with the Oil Shale Office and the Oil Shale Environmental Advisory Panels (which consists of participants from various federal, state, and local agencies including the U.S. Fish and Wildlife Service (FWS), Bureau of Land Management (BLM), Environmental Protection Agency (EPA), Department of Energy (DOE), and the Utah Department of Natural Resources and Energy). In addition, the Environmental Monitoring Manual has also been the subject of extensive public review.

The major goal of the ambient program as discussed in the Environmental Monitoring Manual is to provide a body of information that describes the ecology of the project area in a manner which will:

(1) Allow assessment of changes occurring in the physical and biological characteristics of the tracts that result from the impact of surface disturbances and pollutant discharges.

(2) Guide analysis of causes and effects, thus leading to appropriate mitigation planning.

(3) Guide and assess the effectiveness of mitigation and reclamation measures.

This goal is being met by accomplishing the following tasks, which are detailed in the Environmental Monitoring Manual:

(1) Describe methods that will be used to document the environmental conditions that exist in the project area.

(2) Identify candidate monitoring parameters, sites, and schedules based on the probability of impact, importance, legal requirements, measurability, interpretability, and cost-effectiveness.

(3) Develop statistical procedures for detecting and evaluating the degree of impact.

(4) Develop a quality control/quality assurance program.

(5) Identify criteria for selection of threshold values for specific parameters.

(6) Describe contingency measures to be implemented if the monitoring program fails to explain an environmental perturbation.

As discussed previously, the ambient program described in the Environmental Monitoring Manual was implemented in 1982 and is currently in progress. For this reason, the final ambient monitoring plan (in the form of the Environmental Monitoring Manual) has been submitted to SFC in lieu of the requested ambient monitoring plan outline.

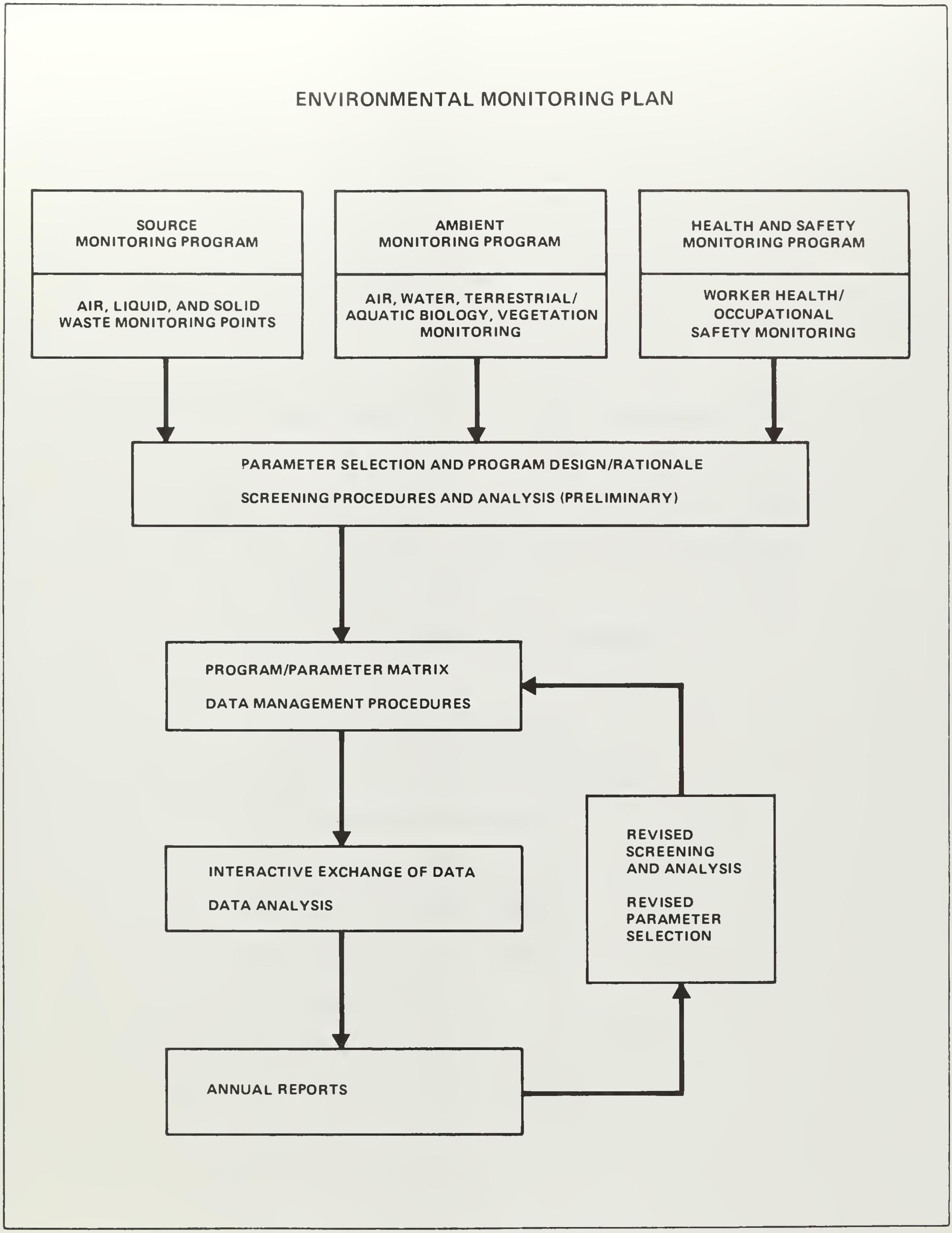
All three monitoring programs include a phase where parameters are screened for inclusion during routine analyses. In the ambient program, this is a tiered approach using potential, operational, and contingency parameters. In the source and health and safety monitoring programs, a definitive preliminary screening phase is clearly specified. In all cases, screening processes will be used to identify those parameters that most clearly reflect the existing environmental conditions during the project life. This will limit the data collection effort to only the most essential and useful variables.

The initiation of the overall monitoring plan will result in large amounts of data being collected from a number of different monitoring points. These data will require careful storage and retrieval procedures. Hence, a data management system will be developed to accurately and quickly access data from all three programs for report generation and analysis. The flow of data and the evaluation of interrelationships among the three individual plans are shown on the last page of this preface.

To adequately assess environmental impacts, data from the three monitoring programs will be exchanged so that both temporal and spatial comparisons can be made. For example, to assess worker health effects of particulates in the area, data from monitors that measure fugitives and emissions from the plant (Source Monitoring Program), the high-volume samplers (Ambient Monitoring Program), and area monitoring (Health and Safety Monitoring Program) will be gathered and analyzed. A well-documented and accurate flow of data into the

statistical/analytical procedures will be used to generate meaningful reports. This role will be filled by the data management system.

Annual reports discussing the results of the overall Environmental Monitoring Progam will be prepared and submitted to SFC. An analysis of significant trends and results will be included in these reports. Furthermore, it is anticipated that semiannual coordination meetings between the SFC and its consulting agencies and the WRSOC environmental staff will be held to consider results of the monitoring program and to evaluate its continuing status and direction.


ENVIRONMENTAL MONITORING PLAN
SOURCE MONITORING PROGRAM
AIR, LIQUID, AND SOLID WASTE MONITORING POINTS
AMBIENT MONITORING PROGRAM
AIR, WATER, TERRESTRIAL/ AQUATIC BIOLOGY, VEGETATION MONITORING
HEALTH AND SAFETY MONITORING PROGRAM
WORKER HEALTH/ OCCUPATIONAL SAFETY MONITORING
PARAMETER SELECTION AND PROGRAM DESIGN/RATIONALE
SCREENING PROCEDURES AND ANALYSIS (PRELIMINARY)
PROGRAM/PARAMETER MATRIX
DATA MANAGEMENT PROCEDURES
INTERACTIVE EXCHANGE OF DATA
DATA ANALYSIS
ANNUAL REPORTS
REVISED SCREENING AND ANALYSIS
REVISED PARAMETER SELECTION

ACKNOWLEDGMENT

The White River Shale Project Phase I Source Monitoring Plan Outline was prepared by the White River Shale Oil Corporation (WRSOC) as agent for the project sponsors: Phillips Petroleum Company, Sohio Shale Oil Company, and Sunoco Energy Development Co. WRSOC acknowledges the contributions of the following organizations during the preparation of this document:

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Sunoco Energy Development Co.

The Ralph M. Parsons Company

The Standard Oil Co. (Ohio)

VTN Consolidated, Inc.

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INTRODUCTION

SECTION 1

INTRODUCTION

Section 131e of the Energy Security Act requires that any organization seeking financial support from the U.S. Synthetic Fuels Corporation must prepare an Environmental Monitoring Plan. According to SFC guidelines, such a plan should include a substantive outline and description of a Source Monitoring Plan that addresses pollutants of concern from oil shale mining, shale processing, shale oil upgrading, and the disposal of processed shale.

The purpose of this section of the White River Shale Project (WRSP) Source Monitoring Plan Outline is to provide a general description of the project, a brief history of environmental monitoring activities associated with the project, and an introduction to the goals and obligations of source monitoring.

1.1 PROJECT DESCRIPTION

The WRSP is located in northeast Utah approximately 50 miles southeast of Vernal (Figure 1-1). The WRSP involves the development of Federal Prototype Oil Shale Lease Tracts Ua and Ub and associated Group 1 properties, which are not part of the federal leases but are part of the project (Figure 1-2). The tracts were acquired in 1974 by the project sponsors - Phillips Petroleum Company, Sohio Shale Oil Company, and Sunoco Energy Development Co. The White River Shale Oil Corporation (WRSOC) has been retained as agent for the owner companies to manage development of the WRSP.

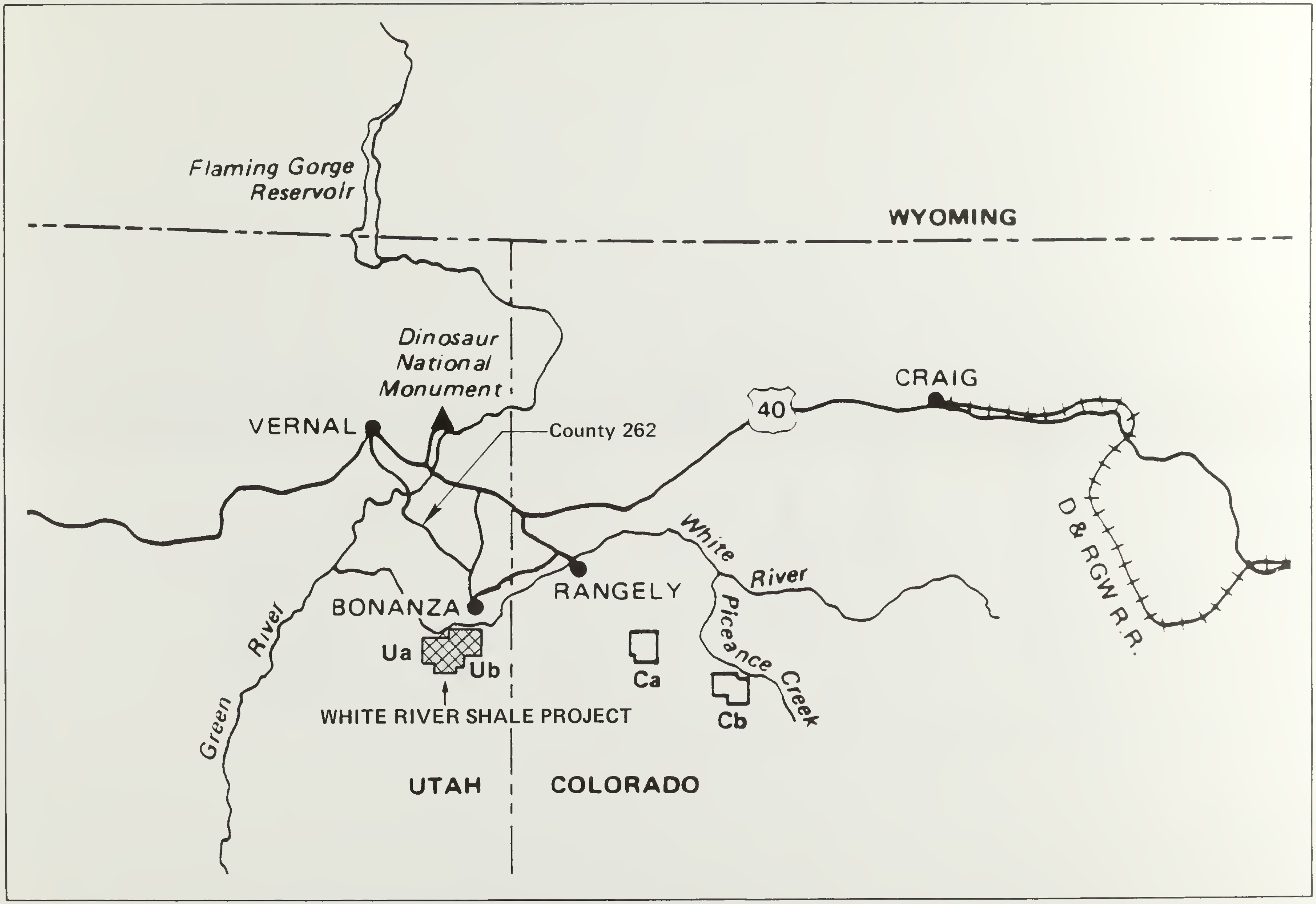

Figure 1-1 - Project Location Map

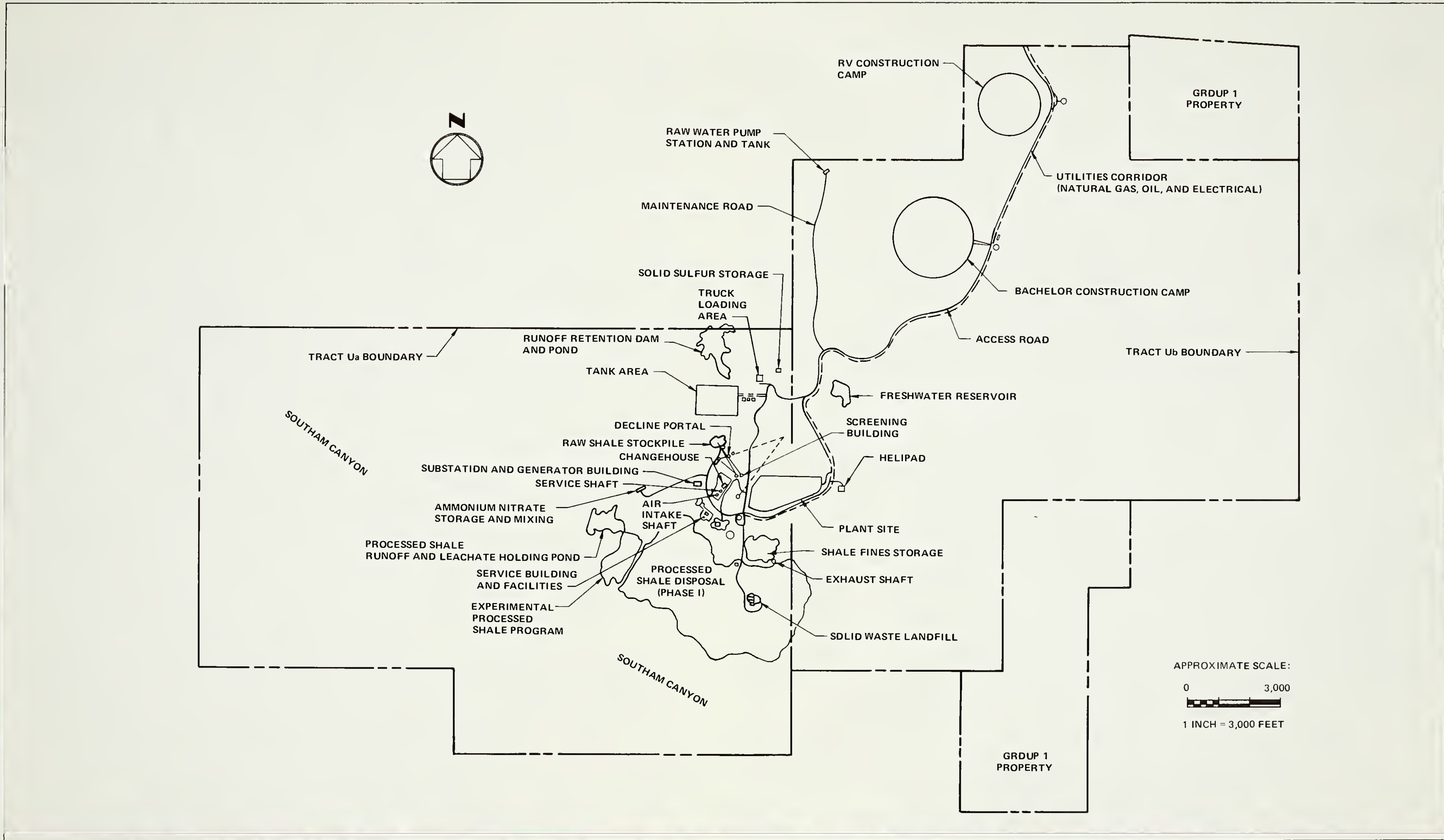

Figure 1-2 · Overall Phase I Plot Plan

The properties are located in the eastern portion of the Uinta Basin south of Bonanza. The White River borders the tracts on the north. Elevation on tract varies from 4,900 to 5,600 ft above sea level. More detailed descriptions of the site are found in the WRSP Detailed Development Plan (August 1981) and the WRSP Final Environmental Baseline Report (October 1977).

The Federal Prototype Oil Shale Leasing Program is under the supervision and administration of the Department of the Interior, Bureau of Land Management, Branch of Oil Shale (formerly known as the Oil Shale Office) located in Grand Junction, Colorado. The WRSP is being developed according to the stipulations and requirements expressed in the leases.

Phase I of the WRSP will consist of a conventional room-and-pillar mine, which will be developed to recover oil shale resources contained within the 55-ft primary mining zone on the tracts. Phase I mine production capacity is estimated at 30,000 tons per stream day (tpsd). The raw shale will be crushed underground and conveyed to the surface for screening and delivery to the retorts. The shale will be processed in two Unishale B retorts and the oil that is produced will be upgraded onsite to produce a high-quality synthetic crude oil. Phase I production of upgraded shale oil product is estimated at 16,573 barrels per stream day (bpsd). Figure 1-2 shows the overall plot plan for Phase I facilities. Figure 1-3 is an artist's conception of Phase I surface facilities. Figure 1-4 shows the site layout for Phase I facilities.

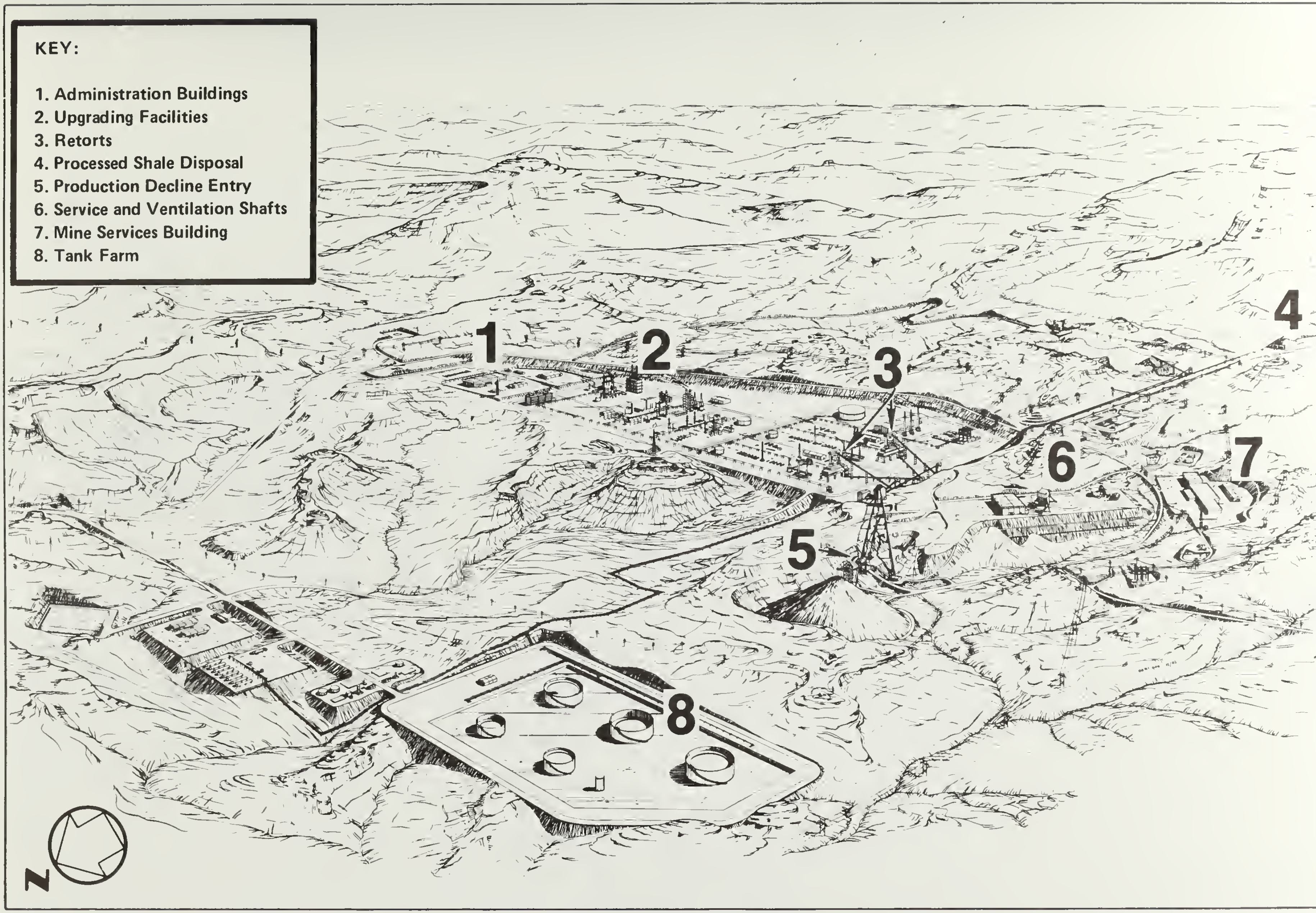

Figure 1-3 - Artist's Conception - Phase I Surface Facility

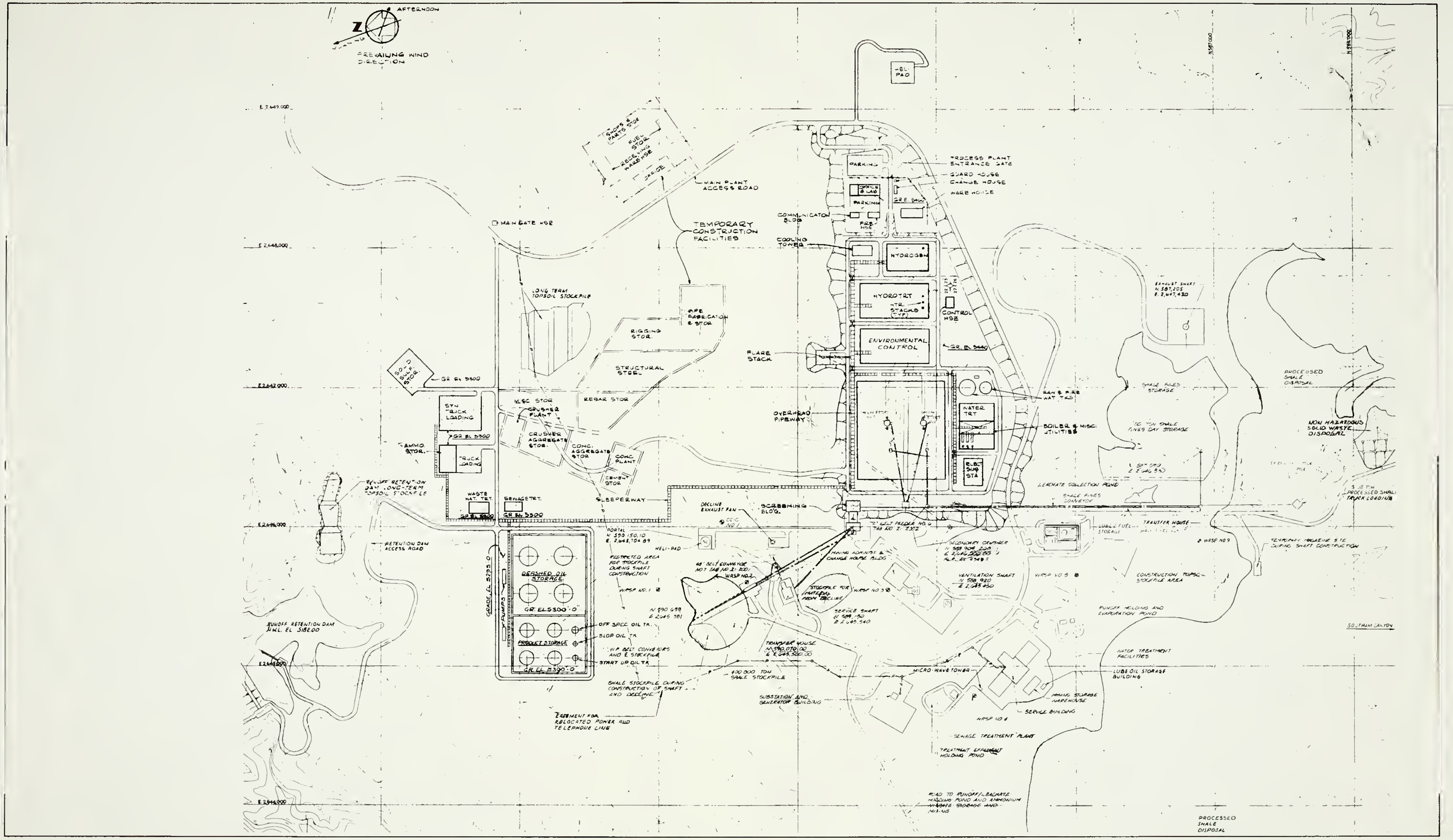

Figure 1-4 - Phase I Site Layout

1.2 ENVIRONMENTAL MONITORING HISTORY OF THE WRSP

Under terms of the federal oil shale lease for Tracts Ua and Ub, the sponsors are required to "... compile data to determine the condition existing prior to any development operations under the lease and shall ... conduct a monitoring program before, during, and subsequent to development operation." The WRSP environmental monitoring program began in 1974 and has continued uninterrupted to the present.

The WRSP Final Environmental Baseline Report (FEBR, October, 1977) contains results and analyses of 2 years of ambient environmental monitoring and data collection. Baseline data are a prerequisite to any monitoring study because subsequent effects are detected as departures from the unaffected (baseline) state. This report and its predecessor, the First Year Environmental Baseline Report (May, 1976) should be consulted for an ecological description of the tracts. Elements of the baseline study consisted of water resources, air resources, biological resources, soils and geology, cultural and paleontological resources, aesthetic considerations, and revegetation of disturbed areas.

Although the FEBR monitoring period ended in January 1977, the monitoring program has been continued, expanding the knowledge of the tract ecosystem and extending the baseline data inventory. Monitoring data are summarized in the FEBR and in subsequent annual reports prepared for the WRSP.

Currently, the WRSP Environmental Monitoring Manual (1982) guides the ambient monitoring effort on tract. This manual was developed by WRSOC in

consultation with the Oil Shale Office and the Oil Shale Environmental Advisory Panel. It provides a detailed description of the approach taken to track impacts to the ambient environment associated with WRSP development, to evaluate the effectiveness of planned mitigation measures, and to provide feedback to minimize identified adverse effects.

Additional details on design and implementation of the ambient monitoring program are found in the WRSP Environmental Monitoring Manual submitted concurrently with this outline.

The WRSOC also sponsors a continuing research effort in the area of revegetation. Over the years this effort has addressed issues concerning how best to reclaim construction-disturbed land and the processed shale disposal pile. Results obtained thus far have been used to develop the current revegetation procedures. Topsoil salvage and reuse, water harvesting, salt tolerant plants, physical and chemical properties of processed shale, and planting methods are some of the areas of current research. Results of project-sponsored research may be found in the report, Revegetation Studies for Disturbed Areas and Processed Shale Disposal Sites, published in 1979 by the Utah State University Institute of Land Rehabilitation, in annual WRSP environmental progress reports, and in more than 17 separate publications written by WRSP consultants. The continuing reclamation research program is described in the WRSP Environmental Monitoring Manual.

1.3 PROGRAM DESIGN AND RATIONALE

WRSOC will develop and implement a source monitoring program that will address all expected significant planned project emission sources and constituents. This Source Monitoring Plan Outline has been developed to address the U.S. Synthetic Fuels Corporation's (SFC's) final Environmental Monitoring Plan Guidelines. The purpose of the outline is to provide a document of sufficient detail and completeness that it may be incorporated into SFC financial assistance contracts and also serve as a firm basis for the eventual development of the source monitoring plan for the WRSP.

It should be recognized that the design and engineering of the WRSP are not completed. Consequently, detailed information required for development of a comprehensive source monitoring plan is not available at this time.

The WRSP is presently scheduled for initial plant startup during the first quarter of 1989. Consequently, there will be an approximate 5-year period between the development of the source monitoring program outline and the actual plant startup. During this 5-year period, Union Oil Company's Parachute Creek, Colorado oil shale processing facilities will be in operation. It is anticipated that the operation of these facilities will generate a substantial amount of environmental data that should be applicable to the WRSP. Therefore, it may be appropriate to reevaluate the scope of the source monitoring program as data become available, especially with regard to supplemental monitoring required for unregulated pollutants.

1.3.1 OBLIGATIONS AND TASKS

In addition to addressing the SFC's Interim Environmental Monitoring Plan Guidelines, the Source Monitoring Plan Outline will be used as a basis for fulfilling monitoring requirements associated with the federal oil shale lease for Tracts Ua and Ub and associated Detailed Development Plan and the requirements associated with the permits issued for the WRSP.

The Source Monitoring Plan Outline is separated into two tasks: compliance monitoring and supplemental monitoring. The plan will address both regulated and unregulated pollutants. Regulated pollutants include those compounds that are presently controlled under existing federal or state environmental legislation. Unregulated substances include those compounds suspected of causing carcinogenesis, mutagenesis, teratogenesis, reproductive effects, other systemic disorders and environmental effects.

A. <u>Compliance Monitoring</u>

Compliance monitoring refers to monitoring that is required by the terms and conditions of permits and approvals or other regulatory obligations. Compliance monitoring is performed to document the performance of control devices and systems and as a check for project compliance with emission standards and applicable WRSP permit conditions.

B. Supplemental Monitoring

Supplemental monitoring refers to any monitoring that is not required by the terms and conditions of permits, approvals, or other regulatory obligations. The major goal of supplemental source monitoring is to document the presence or absence of certain unregulated substances in concentrations that are suspected of causing carcinogenesis, mutagenesis, teratogenesis, reproductive effects, or other systemic disorders and environmental effects. Following initial screening for certain classes of compounds in the WRSP's various waste streams, those substances detected in environmentally significant amounts would be included as parameters in the source monitoring program.

A two-phase approach to monitoring has been incorporated into the WRSP supplemental monitoring outline. Reasons for using a two-phase approach are the lack of environmental data and operating experience for the oil shale industry.

The first phase of source monitoring of unregulated pollutants will use screening techniques to identify substances or general classes of substances of environmental and health concern. The first phase will also incorporate monitoring of parameters of known concern using routine monitoring techniques. The first-phase program will be implemented for at least 1-year of normal plant operation.

After analysis of the resulting data, a second phase will be implemented. The second phase of source monitoring will be a more streamlined and cost-effective program that is responsive to all significant environmental and health concerns.

The Supplemental Monitoring Program as described in this document is based upon a preliminary evaluation of those parameters in the areas of oil shale mining, processing, upgrading, and waste disposal for which the data base is not presently adequate. Prior to the initial operation of the WRSP, a substantial body of environmental information should become available from projects. This data will be evaluated by WRSOC and the WRSP sponsors and the scope and content of the supplemental monitoring program revised as appropriate. Only those parameters for which a specific concern has been identified, or those for which a lack of information remains, will be candidates for monitoring at the WRSP.

1.3.2 ELEMENTS OF THE MONITORING PROGRAM

A. Airborne Pollutants

Major sources of airborne pollutants are included in the scope of the Source Monitoring Plan Outline. Compliance monitoring for regulated pollutants will be implemented according to anticipated requirements of the prevention of significant deterioration (PSD) permit issued for the WRSP. In addition, the compliance and supplemental monitoring programs for

regulated pollutants are designed to confirm the performance of air pollution control equipment, to determine compliance with other applicable permit requirements, and to provide a means for interrelating source emissions with identified ambient impacts.

The supplemental monitoring program for unregulated pollutants will attempt to characterize only those major pollution sources that are likely to have significant quantities of selected pollutants for which regulations have not been developed. For example, fired heaters that utilize plant fuel gas will be candidates for unregulated pollutant monitoring since plant fuel gas consists predominantly of treated retort offgases. However, natural gas-fired heaters would not be monitored in the supplemental monitoring program because these combustion products have been well characterized in conventional industrial operations.

B. Liquids

The WRSP is being designed to achieve zero discharge of liquid wastes. Consequently, it is not anticipated that compliance monitoring for regulated pollutants will be required. However, wastewater treatment systems will be monitored to document pollution control system performance. In addition, leachate and runoff from the processed shale and fines storage piles as well as the outlet from the segregated portion of the

runoff retention pond will be monitored under the supplemental monitoring program. The ambient monitoring program will measure impacts from any unplanned release of liquid waste from the project site.

C. Solids

Processed shale and nonhazardous process wastes will be monitored under the compliance monitoring program to confirm that they are nonhazardous as defined in the Resource Conservation and Recovery Act (RCRA). Hazardous waste generated or disposed of onsite will also be subject to compliance monitoring according to RCRA requirements.

Any offsite disposal of hazardous wastes will be tracked in accordance with RCRA requirements. The disposal site and contractor will be thoroughly investigated prior to disposal of hazardous waste to ensure that proper procedures for handling and disposition of the wastes are being followed and that proper monitoring systems are in place. The WRSOC will not undertake a separate monitoring program for hazardous material transported offsite for disposal.

Onsite waste disposal areas for nonhazardous process wastes will be screened for the presence of regulated and unregulated pollutants in the supplemental monitoring program.

Nonhazardous waste disposal areas for nonprocess wastes (e.g., construction debris, garbage) will not be monitored.

1.4 FACILITIES DESCRIPTION

It is the intent of the three sponsors to develop Federal Prototype Oil Shale Lease Tracts Ua and Ub and associated reserves in northeastern Utah to produce commercial quantities of shale oil. This shale oil production will be accomplished by using room-and-pillar underground mining to extract the ore, surface retorting to recover the raw shale oil, and upgrading of the raw shale oil to a premium synthetic crude for direct utilization in existing refineries. The project is planned for phased development of the mining, processing, and related operations. SFC sponsorship is being requested for Phase I only.

During Phase I, the facility will produce 16,573 bpsd of synthetic crude oil for marketing and distribution with startup scheduled for early 1989. Following the successful operation of the Phase I facility, production will be expanded in two additional phases. The ultimate production capacity anticipated for the WRSP will be approximately 106,000 bpsd, which is expected to occur in the mid 1990s. The expansions will occur through the addition of multiple processing trains. Figure 1-5 is a schedule of development for Phase I of the project.

For ease of discussion, it is practical to divide the facilities description for the WRSP into four characteristic groupings as follows: mining, retorting, shale oil upgrading, and environmental process

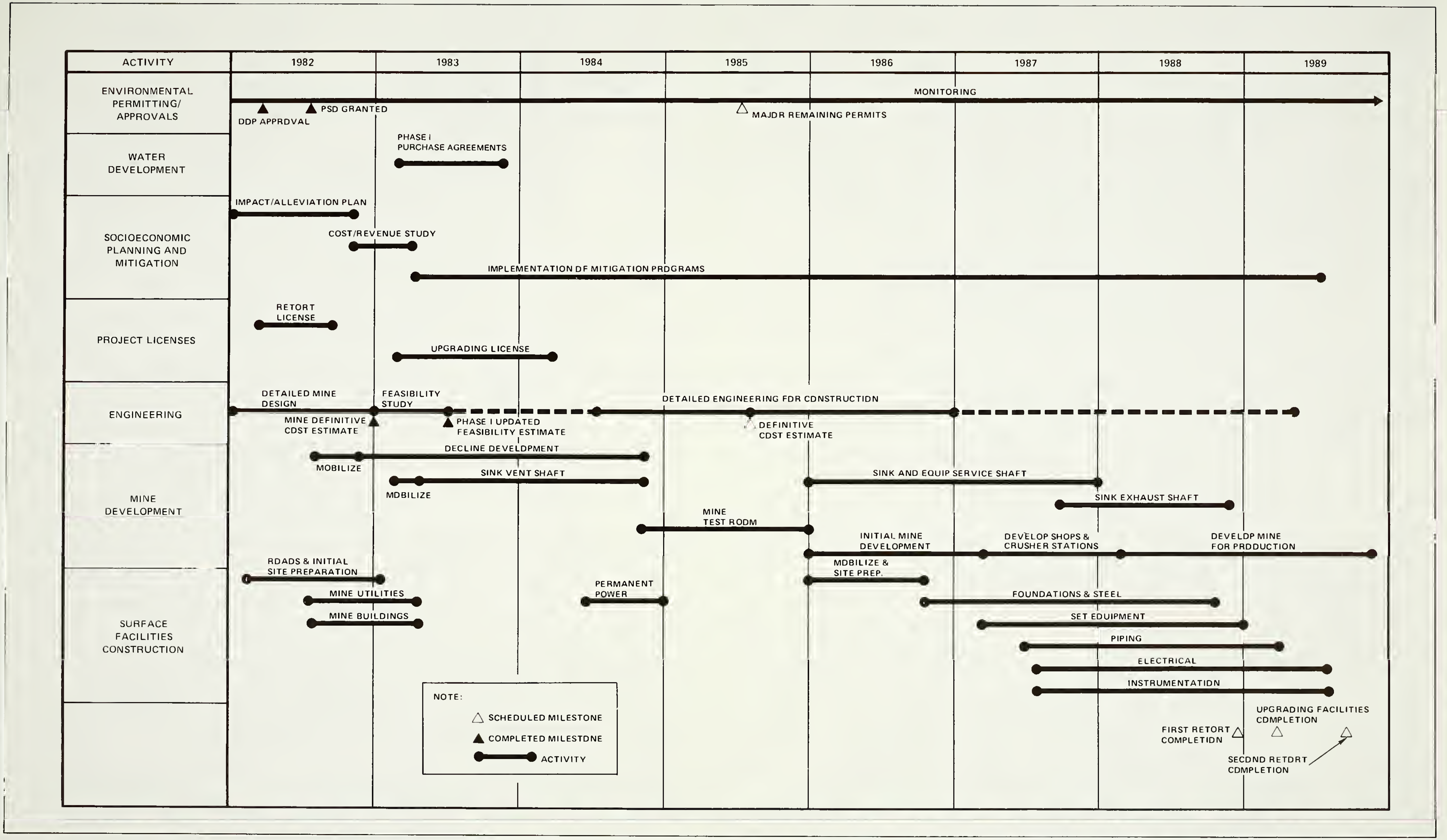

Figure 1-5 · Phase I Project Timetable

treatment and ancillary systems (including utilities). Figure 1-6 is a Phase I overall block flow diagram for the WRSP showing the interrelationship of the four groups.

1.4.1 MINING AND MATERIALS HANDLING

Mining and materials handling includes underground and aboveground activities as shown in Figure 1-7, Mine and Material Handling Block Flow Diagram. Underground activities include mining, ore crushing, and delivery of crushed ore to the surface. Surface activities include ore screening, ore storage and recovery, retort feeds, and processed shale disposal.

A. Underground Mining Facilities and Materials Handling

The Phase I mining zone is located near the centroid of tracts Ua and Ub and lies about 1,000 ft below the surface. The WRSP mine will be located in a 55-ft-thick horizontal section that will intersect most of the ore grade mahogany zone. The ore will yield an average 26.5 gal of oil/ton of shale. The mine is designed to produce 30,000 tpsd of shale from a two-bench mining operation.

Underground mining will be accomplished using the room-and-pillar technique. Rooms with minimum dimensions of 55 ft wide by 55 ft high will be excavated in the mining zone, leaving pillars 60 ft by 75 ft between rooms for mine support. The heading and bench technique to be used is illustrated in Figure 1-8. Excavation will be accomplished by drilling blast

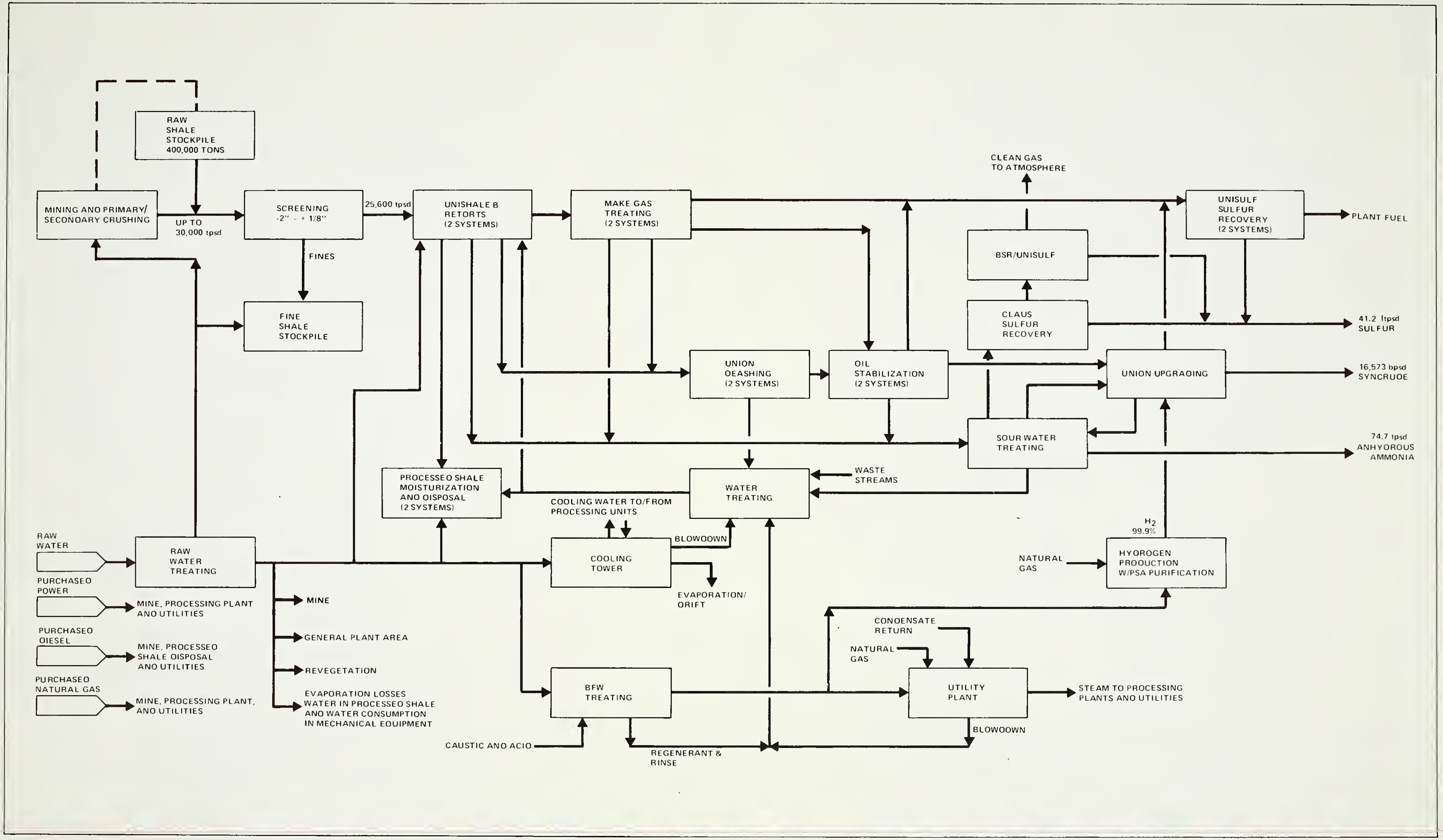

Figure 1-6 - Phase I Overall Block Flow Diagram

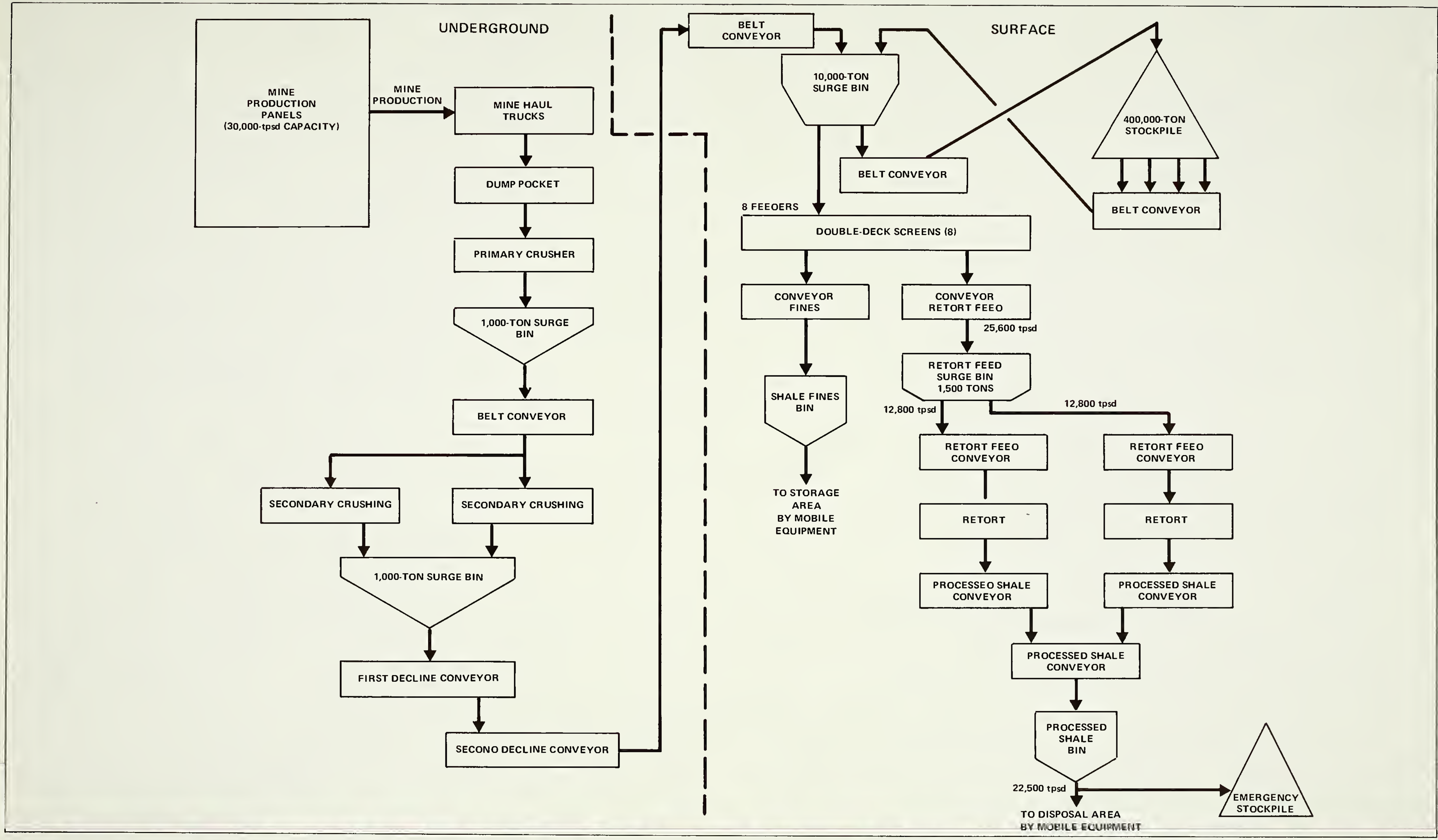

Figure 1-7 - Mine and Materials Handling Block Flow Diagram

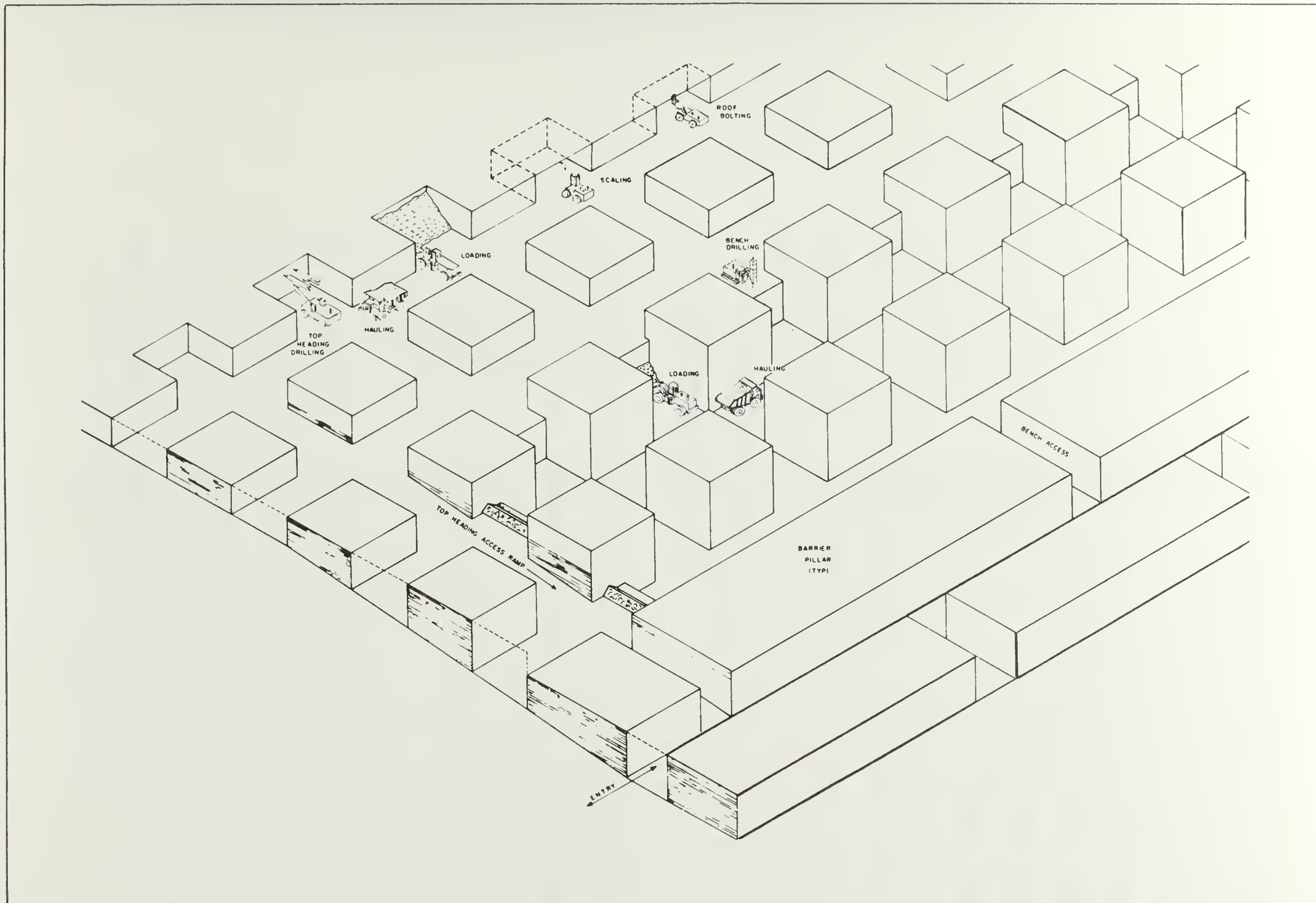

Figure 1-8 - Room-and-Pillar Heading and Bench Mining Concept

holes, blasting, loading and hauling the shale to the crusher. Scaling and rock bolting will stabilize the work area.

Development of the Phase I mine entries has commenced. WRSOC is currently driving a production decline that will extend from the surface into the mining zone. The decline will consist of a 2,000-ft-long upper leg on a 13° slope and a 2,500-ft-long lower leg on a 15° slope from horizontal. The decline will provide initial access to the mining zone for mine construction. In addition to the production decline a 30-ft-diameter air intake shaft is also under construction. An air exhaust shaft and a service shaft are scheduled for development beginning in 1986.

Shale will be crushed underground before being conveyed to the surface. Primary crushing will reduce run-of-mine ore (about 36 in. in diameter) to minus 8 in. ore. Secondary crushing will reduce the minus 8 in. ore to minus 2 in. ore suitable for surface retorting.

An air/mist system at the truck dump to the primary crusher receiving bin will be used for dust suppression. Fugitive dust will also be controlled by baghouses on crushing equipment exhaust points and at the transfer point between lower leg and upper leg conveyors in the decline.

Mine support facilities will be located underground near the service shaft. They will include electrical substations, shops, a warehouse, lube and fuel station, and mine dewatering pumps. Utility pipelines will be located in the service shaft to carry service water, potable water, mine water, fuel, and power and communications cables. Changerooms and main offices will be located on the surface, near the collar of the service shaft.

An efficient ventilation system is vital to safe and efficient mining. The system is designed to provide air of sufficient volume, pressure, and temperature to dilute gases and particulates from diesel equipment, disseminate combustible gases, prevent stratification, and exhaust used air. The Phase I air intake shaft will provide 3,150,000 cfm of air to mining areas. Air control devices will direct airflow to the exhaust shaft, where large surface-mounted fans will pull used air out of the mine. The service shaft will provide 350,000 cfm to the crushing area and maintenance shop areas. This air will be exhausted through the decline via a large fan.

B. Surface Mining Facilities and Materials Handling

The surface materials handling systems will prepare ore from the mine for surface retorting. Crushed shale (minus 2 in.) will be moved from the mine by conveyor belt to a 10,000-ton surge bin. From the surge bin, crushed shale will be fed to

the ore screening plant or to the 400,000-ton crushed shale storage pile.

If direct mine feed to the surge bin is curtailed, crushed shale will be reclaimed from the stockpile via four apron feeders and returned to the surge bin. The stockpile has 70,000 tons of live capacity when full. The additional 330,000 tons may be dozed into the apron feeders as needed. Three baghouse dust collectors are located in the storage and stockpile area to limit fugitive dust emissions: one for the equipment on top of the 10,000-ton surge bin, one for feeders and other equipment under the surge bin, and one for feeders and equipment under the 400,000-ton crushed shale stockpile. The crushed shale stockpile will provide surge capacity for a continuous feed to the retorts.

The screening plant consists of eight double-deck vibrating screens, 6 ft by 16 ft. The screens will remove the minus 1/8-in. crushed shale from the retort feed, and conveyor belts will move this fine material to the fines storage area south of the plant. Trucks or scrapers will then distribute the fines as required. As layers of fines are built up, embankments will be constructed. A runoff and leachate catchment basin, the liquid contents of which will be pumped back to the fines storage area for dust control use and evaporation, will also be constructed. Water sprays at the conveyor transfer point

and truck loading area will be used for dust suppression. Roads will be watered using water tank trucks with sprayers.

After screening, the retort feed will be transported by conveyor to the 1,500-ton-capacity retort feed bin. Fugitive dust from all transfer points and the screens will be controlled with baghouses. The minus 2-in. plus 1/8-in. crushed shale in the 1,500-ton retort feed bin will be moved by separate conveyor belts to feed bins located at the top of each retort.

Processed shale exiting the retorts will be cooled and wetted. A conveyor will move the 22,500 tpsd (Phase I) of processed shale past the fines disposal area and into a 5,000-ton bin in a branch of Southam Canyon, located southwest of the processing area.

Large bottom dump trucks will load processed shale from discharge gates in the 5,000-ton bin and haul it to an onsite disposal area in Southam Canyon. The disposal site for Phase I processed shale will be a side canyon on the eastern ridge of Southam Canyon. The trucks will cycle continuously while the retorts are operating. An emergency discharge area adjacent to the bin will be provided in case the bin becomes overloaded.

The processed shale will be moistened as it leaves the retorts to control dust, to aid in cooling, and to make it easier to compact. The entire length of the conveyor will be covered to reduce dust emissions. Water sprays with chemical wetting agents will be used to reduce emissions where processed shale is discharged from the conveyor into the 5,000-ton bin and where it is discharged from the bin into the haul trucks. Dust from haul roads will be reduced by conventional wetting and stabilization techniques. Water will also be sprayed directly on the processed shale pile to stabilize the surface and to control dust. Revegetation will proceed on the finished section of the processed shale pile shortly after final elevations are reached.

1.4.2 OIL SHALE RETORTING SYSTEMS

The WRSP will use Unishale B retorting technology during Phase I. Each of two retorts will be designed to process 12,800 tpsd of minus 2-in. plus 1/8-in. crushed oil shale. Raw shale will be introduced into the feed chute, which will be sealed with light oil. From this chute, raw shale will be injected upflow into the retort chamber by a solids feeder. In the retort chamber, shale will contact hot recycle gas that will be introduced at the top of the chamber. Products of kerogen pyrolysis will descend to the bottom of the retort, where they will be withdrawn as oil and high-Btu gas. Processed shale will be removed from the top of the retort chamber, cooled, moisturized, and conveyed to disposal.

Shale oil product from the retorts will be treated for removal of suspended particulates in the deashers. This process will involve water washing followed by electrostatic phase separation. In this step, most of the particulates and some of the arsenic will be removed from the shale oil. It is anticipated that the sludge will be handled as a hazardous waste.

Cooling of the retort gas will condense the light oils. The retort gas will then split into two streams, recycle gas and make gas. Recycle gas will be heated in a fired heater and fed to the top of the retort. Make gas will be compressed, scrubbed, and treated to remove ammonia before being sent to the Unisulf plant for hydrogen sulfide removal. Figure 1-9 is a block flow diagram for oil shale retorting.

1.4.3 SHALE OIL UPGRADING

The upgrading facilities will include hydrotreating, stabilization, and hydrogen production. Stabilized crude shale oil will be treated to remove arsenic, nitrogen, and sulfur; other metals also will be removed. The nitrogen in the crude shale oil will be reduced from approximately 2 wt% to less than 100 ppm, and the sulfur will be reduced from approximately 0.7 wt% to 10 ppm. Products and byproducts of the upgrading process consist of upgraded shale oil, anhydrous ammonia, and sulfur. Figure 1-10 is a block flow diagram of the shale oil upgrading process.

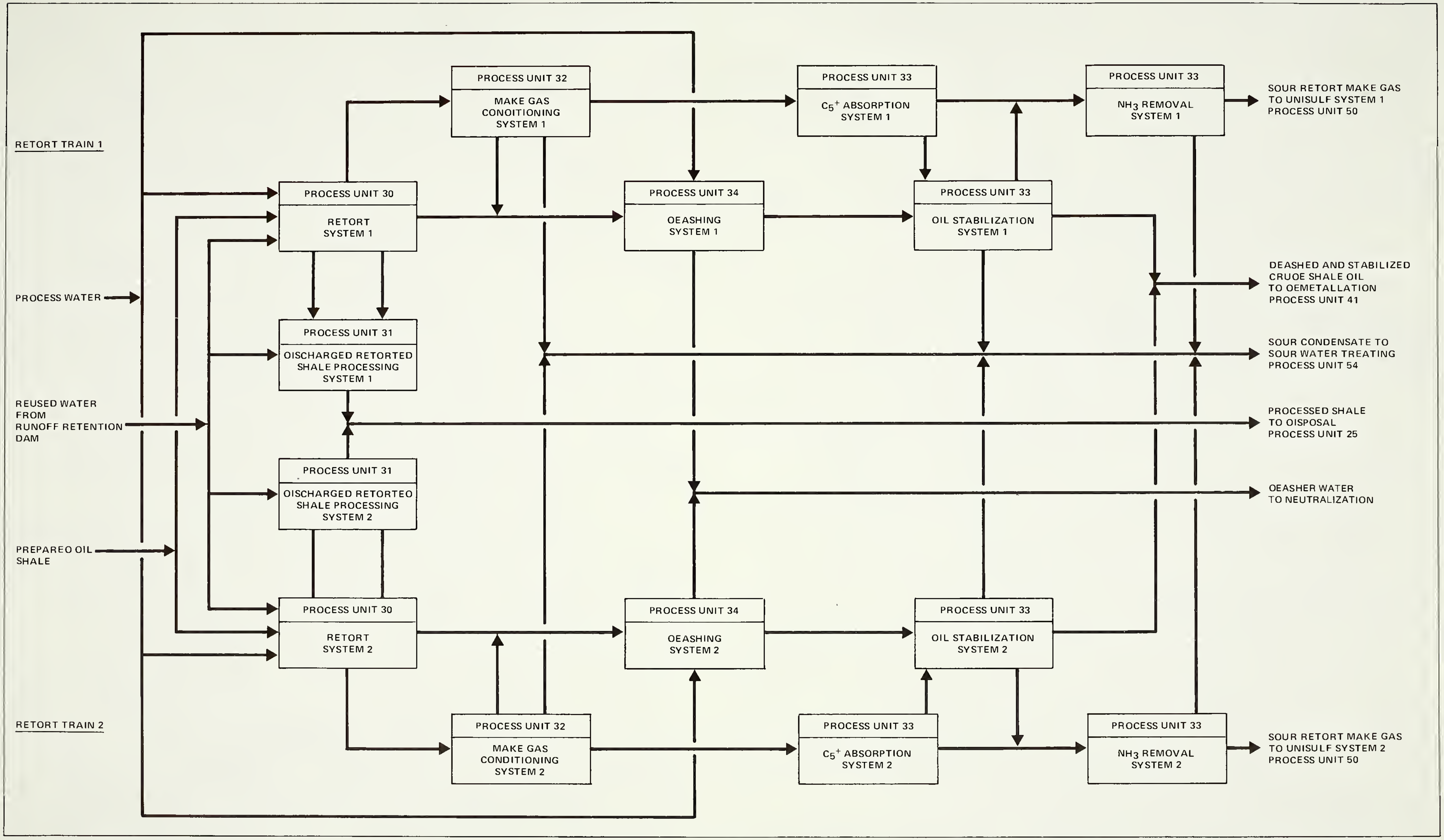

Figure 1-9 - Oil Shale Retorting Block Flow Diagram

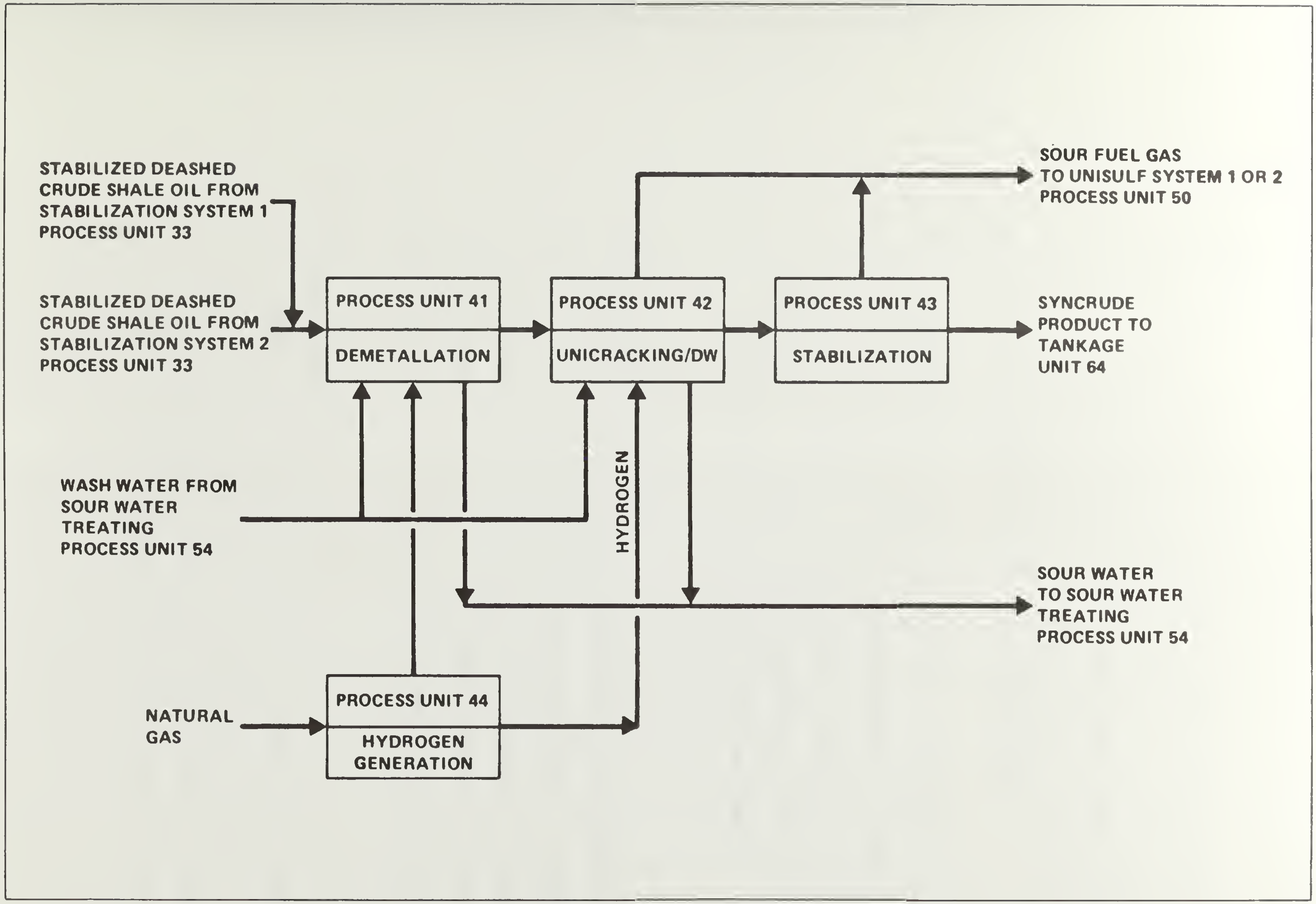

Figure 1-10 - Shale Oil Upgrading
Block Flow Diagram

A. Upgrading

Crude shale oil will be converted into premium quality syncrude using a Union proprietary process. The arsenic will be removed in the first step of the Upgrading process, which involves exposing the oil to a proprietary combination catalyst and absorbent in the presence of hydrogen.

The dearsenated oil will be further hydrotreated over proprietary catalysts and the concentrations of nitrogen, oxygen, and sulfur will be reduced, olefins and polar compounds will be saturated, and the carbon residue, pour point, and viscosity will be lowered to pipeline quality.

B. Syncrude Stabilization

The function of syncrude stabilization will be to remove the light ends from the upgrading effluent, resulting in a stable syncrude product that will not evolve light combustible gases during storage or transport. The lighter components from the product oil will be recovered for use as fuel within the plant.

C. Hydrogen Generation

The function of hydrogen generation will be to supply makeup hydrogen to the demetallation and upgrading processes to balance hydrogen chemical consumption and solution losses. The feedstock to the hydrogen generation plant will be natural gas.

1.4.4 ENVIRONMENTAL PROCESS TREATMENT SYSTEMS

The environmental process treatment systems will treat liquid and gaseous streams from the retorting and upgrading processes. These systems are discussed in Section 2 and include the Unisulf systems, the Claus sulfur recovery system, the tailgas treating system, the sour water treating system, and the flare system.

1.4.5 UTILITIES

A. Steam Systems

There will be three levels of steam systems required for the WRSP: 600 psig, 200 psig, and 50 psig. The 600-psig steam will be generated in three areas: the two natural gas-fired boilers, the hydrogen plant, and the Claus plant. The fired boilers will be the principal source of 600-psig steam, the hydrogen plant will be the second largest source, and the Claus plant will be the smallest source. The principal users of 600-psig steam will be the Phosam-W plant and the turbine drives.

The 200-psig steam will be extracted from the turbine drives on the two retort recycle gas compressors and will also be let down from the 600-psig header. It will be used to provide heat for the sulfur pit and to provide power for the various turbine drives.

Sources of 50-psig steam will be extraction from turbine drives on various fans, pumps, and turbines. The 50-psig steam will be used for the sour water strippers, various heaters in the retort area,

tank heating, building heating, the boiler feedwater deaerator, and consumptive losses such as sealing the retort seal legs.

B. <u>Water Systems</u>

The water management plan of the WRSP calls for zero discharge of liquid wastes. Water will be conserved by recycling and reusing as much as possible. The raw water source will be the White River.

C. <u>Electrical Power Distribution</u>

Electrical power will be purchased from a public utility. Two substations and distribution systems will be located onsite: one in the process area and one in the mine area. Backup generation will be provided for life support systems and critical process equipment.

D. <u>Inert Gas System</u>

Basic components of the inert gas system will be the inert gas generator and compressor. Inert gas will be required for continuous purging of the retort feed chutes and general purging of process piping and equipment during turnarounds. Inert gas will be produced by combustion of natural gas in the inert gas generator. Hot combustion gases will be cooled by generating 50-psig steam. Cooled inert gases will then be compressed to 100 psig for use.

E. Fuel Gas System

Natural gas will be used in the steam generation facilities and in the Beavon sulfur removal (BSR) section of the tail gas treater. It will also be used for hydrogen plant feedstock and inert gas generator feedstock.

Plant fuel gas will be used where neither constant composition nor consistent availability are necessary factors. It will be made by combining excess hydrogen from the hydrogen plant, treated fuel gas from the Unisulf plant, and natural gas.

1.4.6 OFFSITES

Offsite facilities discussed in this section include dams and storage ponds, tankage and loading facilities, product pipelines, the flare system, and solid waste disposal. These facilities are shown in the overall plot plan and the Phase I site layout (Figures 1-2 and 1-4, respectively).

A. Dams and Storage Ponds

Dams and storage ponds are required to store fresh water and to contain runoff. Four major ponds will be used for the Phase I WRSP: the runoff retention pond, the raw shale fines leachate pond, the processed shale runoff and leachate collection pond, and the freshwater reservoir. The first three ponds are described in detail in subsection 2.2.1.

The freshwater reservoir will be located in a canyon with a small watershed situated about 3,000 ft northeast of the process plant site. The freshwater reservoir will be designed to provide sufficient operating capacity and will contain fresh water pumped from the White River.

B. Storage, Pipeline, and Loading Facilities

The main tank farm area, containing the syncrude product and intermediate storage tanks, will consist of 23 acres surrounded by a roadway. All tanks will be constructed of carbon steel. Tanks storing syncrude and deashed crude shale oil will use floating roofs. Cone roofs will be used for all other tanks to minimize snow weight problems. A natural gas atmosphere will be maintained over the hydrocarbon contents, providing an oxygen-free gas blanket. Appropriate vapor control facilities will be installed to control hydrocarbon emissions to the atmosphere. Anhydrous ammonia tanks will be located on a nearby 0.3-acre plot.

Syncrude will be transported by pipeline to local refineries, with occasional shipments by tank trucks. Anhydrous ammonia will be transported offsite by pressurized tank trucks and sold.

Sulfur produced in the Claus and Unisulf plants will be stored temporarily in a sump, from which it will be pumped directly

into tank trucks for shipment, or it will be cast into blocks for storage in a 1.3-acre solid sulfur storage area.

C. Solid Waste Disposal

Finalization of plans for hazardous waste disposal will occur when the types, character, and amounts of hazardous waste have been defined. These plans will be in accordance with RCRA regulations for production, storage, treatment, and disposal of hazardous wastes.

A nonhazardous waste disposal site has been developed onsite. Nonhazardous waste to be disposed of in this area includes inert construction debris, waste fire bricks, wastewater sludge, general plant trash and garbage, and other miscellaneous wastes. Processed shale will be handled as discussed in subsection 1.4.1.B on materials handling.

SECTION 2
POLLUTION CONTROL SYSTEMS

SECTION 2

POLLUTION CONTROL SYSTEMS

Collection and treatment facilities and systems have been incorporated into the WRSP design to ensure adequate pollution control. Process treatment systems and wastewater management systems are discussed in this section.

2.1 PROCESS TREATMENT SYSTEMS

The process treatment systems (Figure 2-1) include the following facilities, which will treat liquid and gaseous streams from the retorting and upgrading processes:

(1) Unisulf systems

(2) Claus sulfur recovery system

(3) Tail gas treating system

(4) Sour water treating system

(5) Flare system

These units are not required directly as part of shale oil retorting and upgrading, but they are required to treat the process streams from these activities. These streams must be treated to reduce pollutant concentrations to environmentally acceptable levels before discharge. Sufficient data on system inputs and outputs will be collected to determine the performance of each unit and to characterize discharges.

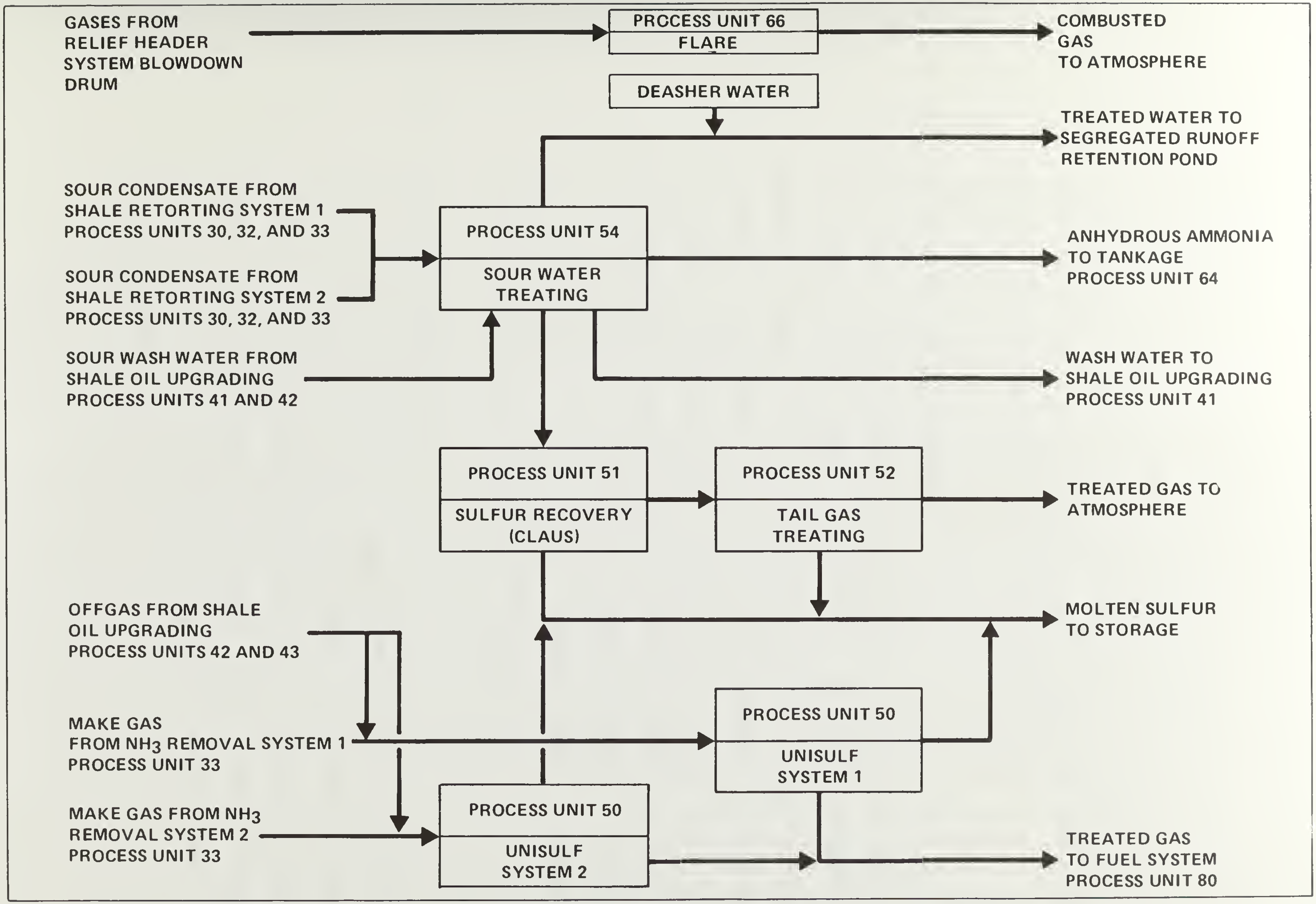

Figure 2-1 - Process Treatment Systems
Block Flow Diagram

2.1.1 UNISULF SYSTEM

The Unisulf system will receive offgas produced in the retorting and shale oil upgrading areas. Hydrogen sulfide will be removed from the gases and recovered as elemental sulfur. The sulfur will either be removed by truck or stored with the sulfur from the Claus plant. Treated gases will be used for in-plant fuel.

2.1.2 CLAUS SULFUR RECOVERY SYSTEM

The Claus sulfur recovery system will treat the gas stream produced in the sour water treating unit. The Claus system will remove hydrogen sulfide from the gas stream, and will produce elemental sulfur and tail gas with unreacted equilibrium quantities of sulfur dioxide, hydrogen sulfide, elemental sulfur, and other sulfur compounds. The sulfur will be removed by truck or stored in solid form for subsequent sale and removal. Tail gas will go to the tail gas treating system for sulfur and sulfur compound removal before atmospheric discharge.

2.1.3 TAIL GAS TREATING SYSTEM

The modified Beavon sulfur removal process tail gas treating system will receive tail gas from the Claus plant, and will remove the majority of the remaining sulfur and sulfur compounds from the stream. The modification to the Beavon sulfur removal process will be the use of a Unisulf plant rather than a Stretford plant in the BSR process.

Discharges from the tail gas treatment system will be elemental sulfur and treated gas. The elemental sulfur will join the sulfur stream from the Claus plant. The treated gas will be discharged to the atmosphere.

2.1.4 SOUR WATER TREATING SYSTEM

Sour water is defined as water containing dissolved ammonia or hydrogen sulfide (or both) and is formed when water contacts a gas or liquid stream containing these compounds. Two different types of sour water will be produced at the WRSP, and segregated treating facilities are provided for each.

Sour wash water from demetallation (Unit 41) and Unicracking/DW (Unit 42) will contain primarily ammonia and hydrogen sulfide. These streams will be collected in the sour wash water surge tank. From the surge tank, the sour wash water will flow to the wash water stripper. Vapor leaving the stripper tower will be cooled and the resulting two-phase stream will be separated, with the gas stream being sent to the Phosam-W plant for ammonia removal and the liquid stream returning to the stripper.

All other sour water streams produced in the retorting, upgrading, and environmental process areas are called sour condensate and will be collected. Treatment of the sour condensate will be identical to that for the wash water.

Treated sour condensate will be sent to the neutralization system. The gas from this system will be combined with the gas from the wash water separator and sent to the Phosam-W system for ammonia recovery. The Phosam-W process absorbs ammonia from the sour gas with lean ammonium phosphate solution. The ammonia is then stripped from the solution with steam and condensed to form anhydrous ammonia.

2.1.5 FLARE

A flare system, using a state-of-the-art design for maximum hydrocarbon destruction and smokeless operation, will be provided. The flare will control gases during emergency relief of pressurized vessels and reactors and during plant startup and turnarounds.

The flare system will be designed to handle the worst-case situation of a total power failure, which could result in the short-term release of combustible gases. During startup, it is expected that the flare will be used for occasional venting. Once stable operating conditions are achieved, the flare will be used during normal operation for venting of surge tanks and condensate pots; it will also be used during routine scheduled maintenance, turnarounds, and emergency conditions.

The flare tip will be designed to combust a mixture of hydrocarbons and carbon monoxide. Sulfur compounds present in the gas stream

will be oxidized to sulfur dioxide. Ammonia and nitrogen compounds will produce nitrogen and water, with small amounts of nitrogen oxides. Steam will be injected at the flare tip to ensure good mixing and smokeless operation.

2.2 WASTEWATER MANAGEMENT SYSTEMS

In addition to the process treatment systems described in subsection 2.1, the WRSP design will include control facilities to treat, collect, and store wastewater streams (Figure 2-2). These are described below.

2.2.1 SEWER SYSTEMS

Wastewater streams will be segregated and collected in four separate sewer systems. The sanitary sewer will collect effluent from domestic wastewaters. Contaminated surface runoff from the process area will be routed to an oily waste sewer. Effluents from the tankage area drains, process unit drains, and other drains from areas subject to oil contamination will be routed to a separate oily waste sewer. The fourth sewer system will handle nonoily wastewater that consists of cooling-tower and steam-plant blowdown effluents, ion exchange regeneration rinse, and process units' blowdown. Storm runoff from undisturbed areas will be segregated and allowed to drain offsite without treatment.

2.2.2 TREATMENT PROCESSES

Oily water from process plant area drains will be sent through an API separator for removal of heavy hydrocarbons. After removal of

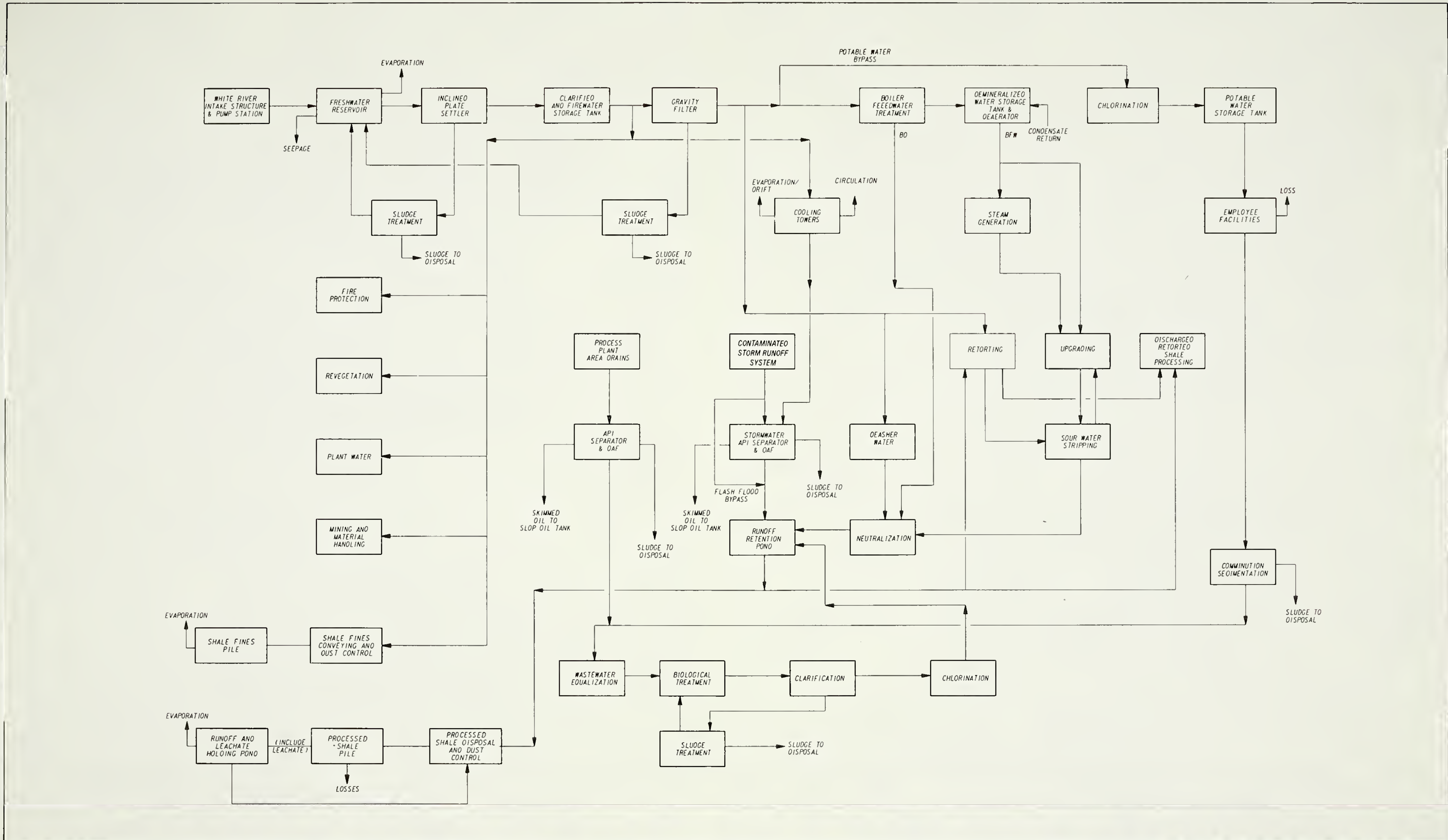

Figure 2-2 - Overall Water Management Block Flow Diagram

hydrocarbons, this effluent will be combined with the effluent from sanitary treatment facilities before undergoing wastewater equalization and biological treatment. The final effluent from these two treatment processes will be clarified and chlorinated before being released to the segregated portion of the runoff retention pond.

Contaminated storm runoff will be sent through another API separator system before being released to the segregated portion of the runoff retention pond.

Deasher water, boiler feedwater treatment blowdown, and sour water stripping effluent are sent through a neutralization process before being released to the segregated portion of the retention pond.

2.2.3 DAMS AND STORAGE PONDS

A system of dams and storage ponds will be constructed to contain all contaminated runoff and treated wastewater, and to prevent any polluted water from entering natural water courses downstream of the WRSP. Figures 1-2 and 1-3 show the location of each dam and pond described in this section.

The WRSP is being designed to achieve zero discharge of contaminated waters. Dams and ponds will be designed so that the

reservoirs can store the 100-yr rainfall of 3 in. in 24 hr plus possible sediments carried by floodwaters from upstream areas.

A. Runoff Retention Dam and Pond

The runoff retention dam and pond will be located about 3,000 ft north of the minesite, below the confluence of two normally dry washes. The pond will have sufficient capacity to contain the 100-yr storm from the 850-acre watershed. All treated water effluents from the facilities will be stored in a segregated section of the pond for eventual reuse. The nominal capacity of the segregated section will be 30 acre-ft. A blended effluent, containing treated process wastewater and runoff waters (called reused water), will be pumped back to the surface facilities and the processed shale disposal area for reuse.

B. Raw Shale Fines Runoff and Leachate Holding Pond

A runoff and leachate holding pond will be constructed on the downstream side of the raw shale fines storage area. This pond will be used to retain all runoff and leachate water from the shale fines storage area. The pond will be designed to hold runoff from a 100-yr storm and possible sediments.

C. Processed Shale Runoff and Leachate Dam and Holding Pond

A dam and holding pond will be constructed below the processed shale disposal area to retain runoff and leachate from the

processed shale pile. The dam will be designed to hold runoff from a 100-yr storm and possible sediments.

SECTION 3
IDENTIFICATION OF EMISSION RELEASE POINTS TO THE ENVIRONMENT

SECTION 3

IDENTIFICATION OF EMISSION RELEASE POINTS TO THE ENVIRONMENT

In this section, sources of potential emissions are identified and characterized with respect to regulated and unregulated pollutants of potential concern. Regulated pollutants include those compounds that are presently controlled under existing federal or state environmental legislation. Unregulated substances refer to those uncontrolled compounds suspected of causing carcinogenesis, mutagenesis, teratogenesis, other reproductive effects, other systemic disorders, and environmental effects (SFC, 1983).

Unregulated compounds of potential concern that may be released to the environment are listed in Section 4. A full characterization of potentially significant unregulated substances is limited by the lack of detailed design information. Potential sources of unregulated pollutants will be characterized, however, during the source monitoring program.

3.1 AIR EMISSIONS

The major air-emission sources associated with the processing area, as well as fugitive emissions and minor point sources (sources expected to have a minimal impact on ambient air quality), are discussed in the individual process source emission descriptions in the following subsections.

3.1.1 MINING AND MATERIAL HANDLING

There will be four general activities in mining and material handling that may produce pollutants. These activities are underground mining, underground crushing and handling of oil shale, aboveground material handling of raw shale, and handling of processed shale.

Mining activities will consist of drilling, blasting, and mucking operations, as well as conveying of raw shale by truck to the crushing area. Potential pollutants generated are particulate matter, blasting fumes, and diesel exhaust. These pollutants will be removed from the mining area by surface-mounted exhaust fans.

Underground processing activities include crushing operations and conveying of raw shale to the surface. Particulates will be the major pollutant generated during these processing activities, and will be vented through the decline exhaust. Baghouses will be used to control particulate emissions from the primary and secondary crushers and the decline transfer point.

Aboveground material handling of raw shale will include conveying and screening of crushed shale, as well as conveying to storage bins, stockpiles, and the retort feed bins. Particulate matter will be released at the outlet of baghouses located at major transfer points and as fugitive emissions controlled with wet suppression techniques.

Following retorting of the shale, the major particulate emissions associated with processed shale material handling will be from a dust collector in the conveyance system and a scrubber separator used to scrub particulates generated in the pug mill wetter. It is possible that organic vapors may also be released from the pug mill wetter. Other sources of emissions related to processed shale handling include transfer of shale to trucks at the processed shale disposal area, vehicle exhaust during processed shale handling, and particulate emissions generated during preparation of the processed shale pile.

3.1.2 COMBUSTION SOURCES

Several types of combustion sources within the plant will emit combustion products to the atmosphere.

A. Process Gas-Fired Units

Fuel gas-fired heaters will include the sponge oil stripper reboiler in the C_5^+ absorption process unit (two units), the reactor charge heater in the demetallation unit (two units), the upgrading reactor charge heater (one unit), and the recycle gas heaters (two units) in the retort process that are used to heat gas for use in the retort. In addition to fuel gas, the demetallation heaters will combust small amounts of oxidizer tank exhaust gas from the Unisulf units. Similarly, the recycle gas heaters will combust small amounts of retort feed chute purge gas and oxidizer tank exhaust gas from the

Unisulf unit as well as plant fuel gas. The hydrogen reforming furnace (one unit) will consume hydrogen plant offgas supplemented by process gas.

Combustion products from process fuel gas will include carbon monoxide, particulates, nitrogen oxides, and sulfur oxides. Because the fuel gas has not been fully characterized, its combustion products may also include trace quantities of unregulated pollutants.

B. Natural Gas-Fired Units

Natural gas-fired heaters will include steam boilers (two units) and the inert gas generator (one unit) used in production of nitrogen-rich purge gas. Combustion products from natural gas will include particulates, nitrogen oxides, carbon monoxide, and sulfur oxides. Because the natural gas used will be pipeline quality, no unregulated pollutants will be released.

3.1.3 FLARE SYSTEM

The flare system is designed to combust gases released during startup, normal, and upset conditions. Sources vented to the flare on an infrequent basis during startup and normal generation will include vapors from washwater drums, feed surge drums, and knockout drums; also, vapors from condensate pots and degassers. The washwater drum in the upgrading area will receive

water from the sour water stripper. Vapors from the washwater drum will be combined with natural gas, and sent to the flare. Vapors from the upgrading feed surge drum will be blanketed with natural gas, and may be vented to the flare. Condensate pots in the Unisulf and Tail Gas Treating Systems and the degasser in the Unisulf System will also release vapors to the flare.

During upset conditions, additional gaseous streams may be combusted in the flare system. If a make gas compressor should fail, make gas will be sent to the flare. If one of the Unisulf plants fails, retort sour fuel gas from the ammonia scrubber in the ammonia removal process may be released for flare combustion. Knockout drums in the retort and hydrogen units will also vent to the flare.

Normally, the major pollutants vented to the flare system will be hydrocarbons and carbon monoxide. In addition, sulfur compounds and nitrogen compounds will be converted to SO_2 and NO_x, respectively. Because many of the streams vented to the flare are not fully characterized, the potential for release of unregulated pollutants from the flare exists. Most of these compounds will be destroyed during combustion.

3.1.4 ENVIRONMENTAL TREATMENT UNITS

The major air emission source in the environmental treatment units will be the treated tail gas released from the modified BSR unit.

This stream may contain low levels of total reduced sulfur compounds.

In the Unisulf Systems (two units), minor atmospheric emissions are expected from the sulfur froth tanks, reslurry tanks, and washwater flash drums. In addition, the sulfur pits in the sulfur recovery units may release H_2S in the form of fugitive emissions.

The sulfur froth tank, balance tank, and reslurry tank in the tail gas treating unit (one unit) will have vents that may release minor amounts of pollutants to the atmosphere.

3.1.5 TANKAGE

Storage tanks with the potential to emit fugitives include the deashed oil storage tanks, the syncrude storage tanks, the slop oil tanks, and the startup oil tanks. The expected pollutants include hydrocarbons and miscellaneous organics; however, these emissions are expected to be minor.

3.1.6 OTHER SOURCES

Other minor fugitive emission sources include fugitive hydrocarbon emissions from compressors and pump seals, valves, flanges, and other connection devices; fugitive particulate matter from the processed shale disposal pile, the raw shale fines storage pile, and the preproduction storage pile; and dissolved salts and particulate matter from cooling tower drift.

3.2 LIQUID EMISSIONS

The WRSP is being designed for zero discharge of wastewaters. Liquid wastes will originate in the various processes as shown on the Water Management block flow diagram (Figure 2-2). There are two general categories of liquid wastes: wastewaters and liquid byproduct wastes. This subsection will discuss both types.

3.2.1 WASTEWATER STREAMS

A. Retention Pond Water

To comply with the zero-discharge design requirements, all process wastewater will be contained onsite in a segregated portion of the runoff retention pond prior to reuse. The pond influents may contain both regulated and unregulated substances. The pond waters will be of sufficient quality to comply with in-plant process requirements for reuse.

Process wastewater streams will be segregated and collected in four separate sewer systems before discharge to the segregated portion of the runoff retention pond: the sanitary sewer, the oily water sewer, the nonoily wastewater sewer, and the contaminated storm runoff sewer. Sanitary sewage and oily wastewater from the API separator will be combined before biological treatment. Nonoily wastewater - which includes water from the sour water stripper, deasher water, and demineralizer wastewaters - will be released to the segregated portion of the retention pond after neutralization.

Contaminated stormwater will be sent to a separate API separator before being sent to the segregated portion of the runoff retention pond. Uncontaminated runoff will be released directly to the runoff retention pond.

Any water produced in the mine will be collected and reused for dust suppression within the mine area.

Water will be reused from both the segregated and unsegregated portions of the runoff pond for processed shale disposal, dust control, and retorted shale cooling.

B. <u>Raw Shale Fines Runoff/Leachate</u>

The raw shale fines will be stockpiled in a canyon located in the same drainage area as the mining facilities. Drainage will be controlled and contained in a downstream catchment basin. It is proposed to pump collected waters back to the fines storage area for dust control and evaporation.

C. <u>Processed Spent Shale Runoff/Leachate</u>

A processed shale disposal pile will be developed in Southam Canyon. Runoff/leachate from this pile will be collected in a small dam and pond constructed at the toe of the pile and reused for dust control.

3.2.2 LIQUID BYPRODUCT WASTES

Liquid byproduct wastes will consist of slop oil and off-specification oil from the syncrude processing areas. Slop oil will be reintroduced into the system. Off-specification oil will be generated when syncrude processing does not proceed as designed (e.g., equipment failure, process interruption caused by power failure). This oil will be temporarily stored, and then recycled through the system when normal operation resumes.

3.3 SOLID WASTES

Major solid wastes from the WRSP include processed shale, solid sulfur, spent catalysts, and assorted sludges.

Processed shale will be placed in a side canyon on the eastern ridge of Southam Canyon. Filling will proceed with about a 5% slope on the advancing edge to permit the bottom dump trucks to descend and ascend the slope, dumping the material in layers and compacting it with their wheels. Bulldozers will complete the shaping of the area. The pile will have an average depth of 250 ft and a maximum depth of 400 ft.

Sulfur will be solidified into blocks, and marketed.

Spent catalysts produced as waste products in hydrogen generation will include a cobalt-molybdenum catalyst from the HDS Reactor, a nickel catalyst used for reforming hydrogen, an iron oxide catalyst that assists the high-temperature shift reaction, and a zinc oxide catalyst for H_2S

removal. In the Claus sulfur recovery plant, a catalyst will be used to facilitate the conversion of sulfur dioxide and hydrogen sulfide to elemental sulfur. Catalysts will also be used in the guard bed reactors in the upgrading process. In general, spent catalysts will be returned to the supplier for regeneration. When applicable, the option of selling metal-rich catalysts to metal recovery firms will be explored. If a catalyst can neither be regenerated nor used in metals recovery, it will be disposed of in a solid-waste or hazardous landfill, depending on its classification under RCRA.

Sludges will be associated with the following areas: API separator and DAF, gravity filter in potable water treatment, biological treatment, and comminution sedimentation. All sludges will be compacted, dewatered, and analyzed to determine the classification of each under RCRA. Following analysis, the sludge will be transported for disposal in an appropriate landfill.

SECTION 4
ENVIRONMENTAL MONITORING PROGRAM

SECTION 4

ENVIRONMENTAL MONITORING PROGRAM

4.1 PROGRAM DESIGN AND RATIONALE

In this section, an overall approach to the characterization of sources of potential regulated and unregulated pollutants will be discussed. As mentioned in subsection 1.1, the source monitoring program will be divided into two separate tasks: a compliance monitoring program that will address regulated pollutants associated with permit conditions and a supplemental monitoring program that will deal with both regulated pollutants not included under the compliance monitoring program and unregulated pollutants. Tables 4-1 through 4-3 summarize the proposed compliance and supplemental monitoring program for both regulated and unregulated pollutants.

In conjunction with the proposed source monitoring program, WRSOC has prepared a health and safety monitoring program. In addition, an ambient monitoring program is currently in effect at the plant site. All three monitoring programs are interrelated and data obtained from each will be used in the remaining programs. For instance, data obtained from monitoring worker exposure in a particular area of the upgrading plant may be useful in interpreting the significance of data obtained from the supplemental monitoring program.

The scope and duration of the Supplemental Monitoring Program to be implemented after stable operation of the WRSP is achieved (expected to

Emission Source	Compliance Monitoring							Supplemental Monitoring[2]
	SOx	NOx	Particulates[1]	HC	CO	H_2S	Comments	
FUEL GAS COMBUSTION SOURCES								
Sponge oil stripper reboiler	T[3]	T	T		T		Stack emissions will be tested within 180 days of startup and every 5 years thereafter, or as required by air quality permits. NOx will also be monitored continuously at one recycle gas heater. Fuel gas will be continuously monitored for H_2S and TRS, and will be characterized by supplemental monitoring.	Combustion gas at one retort recycle gas heater will be monitored for regulated and unregulated pollutants. Emissions from this source will characterize all fuel gas combustion sources. Fuel gas will be monitored at Unisulf outlet as described below.
Reactor charge heater (demetallation)	T	T	T		T			
Process heater	T	T	T		T			
H_2 reformer heater	T	T	T		T			
Retort recycle gas heater	T	T, C[4]	T		T			
NATURAL GAS COMBUSTION SOURCES								
Steam boilers		T, C			T		All sources will be tested for compliance with permit requirements. NOx will be continuously monitored at one steam boiler.	No supplemental monitoring is required for combustion of pipeline natural gas.
Inert gas generator		T			T			
ENVIRONMENTAL TREATMENT UNITS								
Unisulf						T, C	Sources will be tested for compliance with permit requirements. Monitoring of flare emissions is not feasible. Inlet and outlet gas streams for one Unisulf and one tail gas treating unit will be monitored continously for H_2S, TRS.	Outlet gas streams for one Unisulf unit and the tail gas treating unit will be monitored. Inlet gas stream to flare will be monitored. Area monitoring for H_2S will be accomplished in the Health and Safety Program.
Tail gas treating						T, C		
Flare								
OTHER POINT SOURCES								
Retorted shale wetter			T				Emissions from shale wetter particulate control system and various baghouses will be tested. Emissions from mine exhausts will be reflected in ambient monitoring results.	Emissions from shale wetter particulate control system will be monitored for regulated and unregulated pollutants.
Materials handling baghouses			T					
Mine exhaust (ventilation exhaust shaft, decline)								
FUGITIVE SOURCES								
HC fugitives from compressors, pumps, valves, flanges, and other connection devices				T			A fugitive HC monitoring program for compressors, valves, pumps, and flanges will be developed in compliance with air quality permit requirements. Periodic inspections will be conducted to verify integrity of tank seals; gap area measurements will be taken per NSPS requirements.	Area and/or dosimeter monitoring of H_2S, particulates, and other substances regulated by OSHA and MSHA will be conducted as a portion of the Health and Safety Program. The processed shale disposal area and sulfur storage area will be monitored in the supplemental monitoring program; additional data will be available from the Ambient Monitoring and Health and Safety Programs.
HC fugitives from floating roof, cone roof storage tanks								
Sulfur pit and associated Unisulf tankage								
Particulate fugitives from conveyors, raw shale fines pile, and processed shale disposal area								
Mine work area								

1 Includes TSP and inhaleables as appropriate.
2 Refer to Tables 4-4 through 4-6 for details of the supplemental monitoring program.
3 T = Periodic compliance testing.
4 C = Continuous monitoring.

Table 4-2 - Summary of Proposed Water Monitoring for First-Phase Program

Source	Compliance Monitoring	Supplemental Monitoring[1]
Segregated portion of runoff retention pond	Compliance monitoring requirements currently undefined.	Monitor outlet from pond prior to reuse
Runoff retention pond	As required by zero discharge NPDES permit	No
Runoff/leachate from processed shale pile	As required by zero discharge NPDES permit	Monitor collected waters
Runoff/leachate from fines storage pile	As required by zero discharge NPDES permit	Monitor collected waters
Sour water treating	Test outlet, zero discharge	Test inlet for compliance parameters to determine system performance
Biotreatment system	Test outlet, zero discharge	Test inlet for compliance parameters to determine system performance

[1] Refer to Tables 4-4 through 4-6 for details of Supplemental Monitoring Program.

Table 4-3 - Summary of Proposed Solid Waste Monitoring for First-Phase Program

Source	Compliance Monitoring	Supplemental Monitoring[1]
Processed shale	Not required; however, RCRA characterization tests will be conducted	According to Supplemental Monitoring Program
Nonhazardous process wastes	Not required; however, RCRA characterization tests will be conducted	According to Supplemental Monitoring Program
Nonhazardous wastes not process related	Not required	No
Hazardous wastes	Test as required by RCRA for generator, storage, or disposal facilities	No

[1]Refer to Tables 4-4 through 4-6 for details of supplemental monitoring program.

occur during 1989) will depend to a large extent upon the data collected by other projects during the interim years (1983-1988). Also, the methodology used to analyze the various parameters finally selected for monitoring at the WRSP will be subject to change.

4.1.1 COMPLIANCE MONITORING RATIONALE

Compliance monitoring addresses monitoring that is required by terms and conditions of permits and approvals or other regulatory obligations. To develop the Compliance Monitoring section of the Source Monitoring Plan Outline, it was often necessary to make assumptions concerning anticipated permit conditions. For this

reason, as actual permit conditions are stipulated, the final form of the compliance monitoring program could vary from the outline.

It is assumed that the compliance monitoring program will entail two types of monitoring: periodic source sampling (i.e., testing) and continuous emission monitoring. The compliance monitoring section of Tables 4-1, 4-2, and 4-3 are based upon this premise.

Regulated pollutants to be monitored as part of the compliance monitoring program include gaseous, aqueous, and solid waste parameters. The approach to monitoring regulated gaseous emissions emphasizes major emission sources requiring compliance monitoring to fulfill permit conditions. It is assumed that continuous emission monitoring will be required whenever an applicable New Source Performance Standard (NSPS) exists. All other sources will be periodically tested according to State of Utah air quality requirements to ensure compliance with applicable emission rates. Compliance testing for gaseous emissions will utilize EPA reference methods.

The WRSP is being designed for zero discharge of wastewaters; hence, compliance monitoring requirements are not anticipated. Monitoring to determine the performance of wastewater treatment systems will be addressed by the monitoring program. In addition, the supplemental monitoring program will address monitoring of wastewater prior to reuse within the plant area.

Compliance monitoring for solid wastes will include all characterization and/or monitoring requirements associated with RCRA.

4.1.2 SUPPLEMENTAL MONITORING RATIONALE

Since there are few environmental and health data applicable to the WRSP, the proposed supplemental monitoring program will use a two-phase approach to monitor regulated and unregulated pollutants. The first phase will include routine monitoring of areas where existing data indicate pollutants may be produced in significant quantities. It will also emphasize a number of screening analyses to identify substances of potential environmental and health concern. Data acquired during the screening phase will then be evaluated to refine the scope of the routine supplemental monitoring that would constitute the second phase of the program. It is anticipated that this screening process will last at least one year.

Only those process and waste streams that come in contact with the environment will be addressed by the supplemental program. In addition, the supplemental program will also be used to evaluate emergency and startup conditions once steady-state operation has been achieved.

The supplemental program has been designed to minimize the number of sampling points and still adequately characterize the gaseous,

solid, and aqueous effluents that come in contact with the environment. Subsection 4.3.1B summarizes recommended monitoring parameters, sampling frequencies, and analytical methods. The following paragraphs will discuss the philosophy used to select supplemental monitoring sources.

There are five categories of combustion sources within the process area that fire fuel gas containing a high percentage of treated retort make gas. This gas stream will be treated for H_2S removal in the Unisulf system. The combustion products from this gas stream will be monitored for pollutants that may be associated with the retort make gas. However, only one combustion source will be monitored since it is reasonably assumed that the combustion gas composition from all five sources will be relatively uniform. In addition, the outlet stream from one Unisulf unit will be included in the supplemental monitoring program since the stream serves as the primary source of fuel gas for combustion sources.

The outlet from the tail gas treating unit will also be sampled for pollutants since this unit processes gas released from the sour water treatment system. The water treated by this system has been in contact with various process streams and may contain unregulated pollutants.

Natural gas-fired combustion sources will not be analyzed under the supplemental monitoring program.

The flare will combust vapors from various process vents during normal and upset conditions. The inlet to the flare will be monitored under the supplemental monitoring program. The various vents that feed the flare will not be monitored unless a significant problem is detected by the flare inlet monitoring.

The outlet from the retorted shale wetter will be monitored since there is a possibility of releasing as of yet uncharacterized hydrocarbons during the cooling/wetting process. Product storage tanks will be designed according to API specifications and NSPS requirements; therefore, emissions from storage tanks are expected to be minimal and supplemental monitoring will not be employed. Sulfur pits and associated Unisulf tankage will be monitored.

Fugitive emissions from pumps, compressors, etc., as well as fugitives from storage and disposal sites are sufficiently covered by appropriate regulations and further characterization will be performed in the health and safety program. Supplemental monitoring for mining/material handling fugitive emissions will not be considered since these areas will also be covered by the health and safety program.

Wastewaters that enter the segregated portion of the runoff retention pond are addressed by the supplemental monitoring program since these wastewaters may contain various classes of pollutants. The outlet from the pond will be sampled; these waters

will be reused within the process, primarily for cooling of processed shale and suppression of dust. However, individual wastewater streams that enter the segregated portion of the pond will not be sampled unless a significant problem is determined from sampling the outlet of the pond. In such an instance, analysis of individual influent stream characteristics to isolate the problem source would be undertaken as a contingency measure.

Runoff/leachate from the fines storage pile and runoff/leachate from the processed shale pile will be monitored to fully characterize the composition of these materials.

Supplemental monitoring will be conducted on processed shale and nonhazardous process wastes as shown in Table 4-3. These waste disposal areas, in addition to representing a contact point with the ambient environment, are frequented by workers charged with constructing or managing the disposal piles. Therefore, the solids will be characterized for substances of potential environmental and health concern.

Nonhazardous wastes that are not process related (e.g., construction debris, garbage) will not be monitored. Hazardous wastes will also not be monitored under the supplemental program because they are analyzed as part of compliance monitoring under RCRA.

4.1.3 EMERGENCY/UPSET CONDITIONS

Once the process reaches steady-state operation, special monitoring programs will be conducted during subsequent startup, shutdown, and various upset conditions. Because of the transient nature of startup, shutdown, and upset conditions, the supplemental monitoring will be more frequent during these periods than monitoring proposed during normal operation. Since there is currently no commercial operating experience with this process, specific approaches to identification of sources and frequency will be developed when system vulnerabilities are known and permit requirements are developed. Much of the instrumentation and sampling points for compliance monitoring or routine supplemental monitoring will already be in place in the system (e.g., at the flare inlet, before/after environmental treatment units) and can be utilized directly during offnormal conditions. Supplemental monitoring will provide data not available through compliance monitoring techniques, such as pollutants generated at specific leakage sites during equipment failure and those generated during a range of emergency conditions. Frequencies and general sampling techniques employed in supplemental monitoring during emergency conditions are described in subsection 4.3.1B. To ensure that there are time-equivalent data for normal plant operations, one or more special sampling periods during normal operations will be conducted in which the same sampling frequency used in emergency conditions is employed. This coordination of sampling periods

will facilitate direct comparison of data under various operational conditions.

4.2 COMPLIANCE MONITORING

Regulated pollutants to be monitored under the WRSP monitoring program include gaseous, liquid, and solid wastes (see Tables 4-1, 4-2, and 4-3). In this subsection, specific elements of compliance monitoring program design will be addressed. These elements include parameters to be measured and sampling locations, methodology, and frequency.

4.2.1 GASEOUS EMISSIONS

The approach to monitoring gaseous emissions emphasizes major pollutant sources. Major sources of atmospheric emissions are discussed in Section 3 and essentially include combustion products from process heaters, boilers, and flares; tail gas from environmental treatment units; fugitive emissions from storage tanks; and equipment losses within specific units. Gaseous parameters that will be monitored include criteria and noncriteria pollutants listed in Table 4-1.

Process heaters fired with process-derived fuel gas will be tested at the outlet for gaseous parameters as indicated in Table 4-1. One representative heater, a recycle gas heater, will be continuously monitored for NO_x. SO_2 emissions will be determined by monitoring the sulfur content of the process fuel gas.

For natural gas-fired process heaters and boilers, one representative source will be continuously monitored for NO_x, as the composition of purchased gas will be uniform and low-NO_x burner function will be verified during performance testing. Monitoring methods will include continuous stack emission monitoring and compliance testing as required by EPA standard methods of analysis.

Environmental treatment units employed for process gas cleanup include the Unisulf process unit and the tail gas treatment unit. One unit will be tested at the inlet and outlet in each system to determine the effectiveness of total reduced sulfur removal. Continuous H_2S and TRS monitoring will be conducted.

Fugitive hydrocarbon emissions are expected from the tankage area. There are three types of storage tanks in this area: floating roof tanks for storage of syncrude and deashed crude shale oil, pressurized tanks for ammonia storage, and cone roof tanks for off-specification and slop oils. There are no emissions from pressurized tanks, so only cone and floating roof tanks will be inspected to verify proper operation of seals and vents. An inspection and maintenance program for fugitive hydrocarbons from compressor seals, pumps, valves, flanges, and other connection devices will be designed and implemented.

The retorted shale wetter and material handling baghouses will be tested for particulate emissions as indicated in Table 4-1. Other sources of particulate matter monitored under the ambient and health and safety programs will be tested. These sources include the processed shale, raw shale fines, preproduction storage piles, and mine exhaust in the mining/material handling area.

Specific frequencies for compliance monitoring of gaseous pollutants will be dictated by permit requirements and as such cannot be determined at this time. However, it is anticipated that compliance testing of the sources listed in Table 4-1 will be required within 180 days following startup and every five years thereafter.

4.2.2 LIQUID EMISSIONS

The overall wastewater management system is designed for zero discharge. It is anticipated that compliance monitoring will not be required. Testing to verify effluent quality prior to reuse will be performed as required. Wastewater treatment unit sampling frequencies cannot be determined at this time but will be addressed in the detailed monitoring plan.

4.2.3 SOLID WASTES

Solid wastes generated in the process will include processed shale, nonhazardous process wastes, nonhazardous wastes not related to process activities, and hazardous waste.

To determine environmentally acceptable disposal techniques, each type of solid waste, other than nonhazardous nonprocess wastes, will be analyzed according to criteria set forth under RCRA. These criteria include corrosivity, reactivity, ignitability, and EP toxicity.

Hazardous wastes will be monitored in compliance with RCRA requirements applicable to their generation, storage, and disposal. Specific monitoring requirements will be dictated by permits/regulations and development of WRSP hazardous waste plans.

4.3 SUPPLEMENTAL MONITORING

Supplemental monitoring refers to the monitoring of regulated and unregulated substances for which monitoring is not required by permits, approvals, or other regulatory obligations and which may be present at concentrations of significant environmental or health concern. The proposed supplemental monitoring program will use a two-phase approach to identify and characterize unregulated pollutants in air emissions, water effluents, and solid wastes. Figure 4-1 presents a block flow diagram of the general procedure to be used in developing the final source monitoring program.

4.3.1 FIRST-PHASE MONITORING

The purpose of the first-phase program is to identify substances of significant environmental or health concern, to assist in the

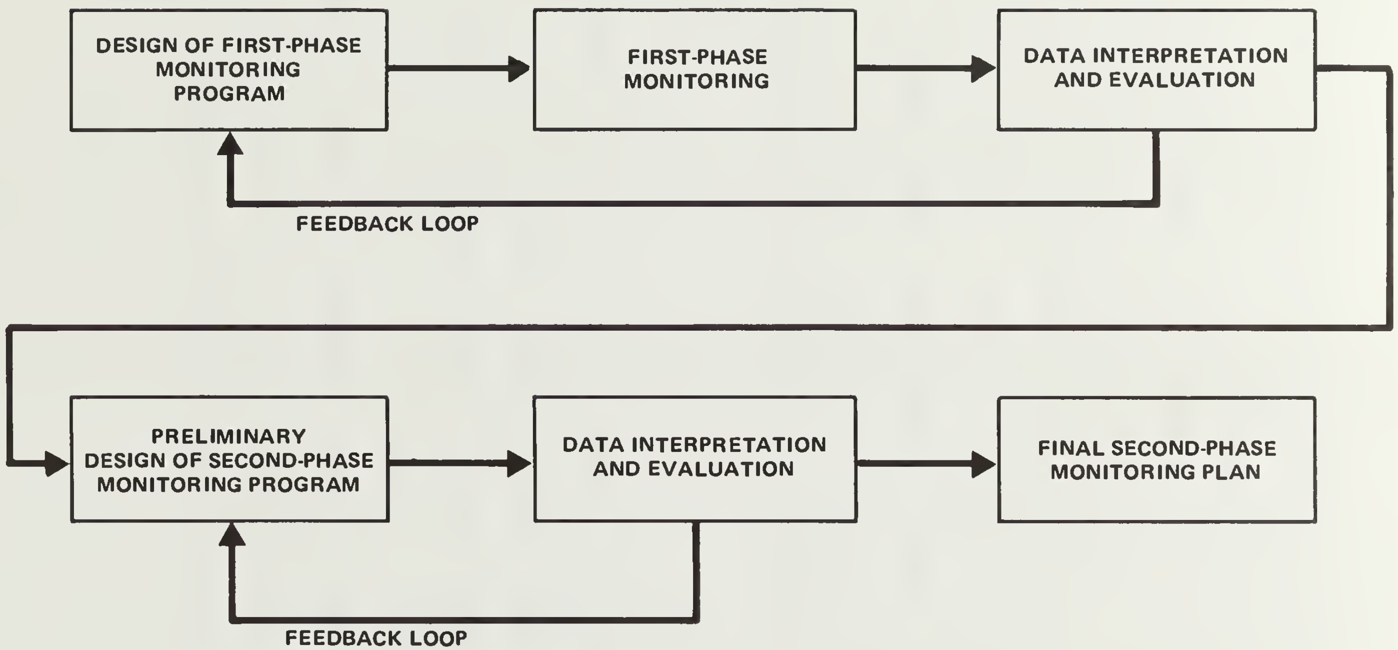

Figure 4-1 - Supplemental Monitoring Program Development Procedure

design of the second-phase monitoring program, and to assess the performance of environmental control systems.

First-phase monitoring will include both screening and routine analytical programs to completely characterize the waste streams as indicated in Tables 4-1 through 4-3. Survey analytical methods that are capable of measuring a wide range of constituents at low concentrations will be used to screen the wastes for unanticipated important parameters. More routine and accurate tests will be used to measure those constituents that have a high probability of being present or are important in defining background chemistry and assessing the performance of environmental pollution control systems.

The first-phase program will be implemented throughout at least 1 year of normal plant operation and will consist of two (semiannual) intensive 5-day sampling periods supplemented by other periodic measurements. Special programs also will be conducted during plant startup and shutdown and during various upset conditions. The first-phase program will be designed to collect sufficient samples to obtain statistically significant results.

A. Parameter Selection Methodology

This subsection describes the procedure that will be used to select parameters and to determine monitoring frequency for pollutants during the first-phase program.

Parameters will be selected as candidates for first-phase monitoring using two separate procedures that address relative knowledge of oil shale wastes. A review of available data on many oil shale processes involving western oil shales has demonstrated that there are chemical substances common to all oil shale wastes. What distinguishes one process from the next, in most cases, is relative concentration. This suggests that two separate approaches be used to develop the first-phase program. In the first approach, called screening analyses, survey analytical methods are used to determine which constituents are present. In the second approach, called routine analyses, parameters believed to be present in oil shale wastes at concentrations of significant environmental or health concerns or that are important in defining background chemistry or control systems performance are periodically monitored. These two classes of analyses differ in both the type of analytical methods used and the frequency of analysis.

(1) Screening Analyses. The purpose of these analyses is to determine the chemical composition of wastes in those

cases where there are inadequate data to validate the initial selection of the routine monitoring parameters discussed in subsection 4.3.1B. Survey analytical methods will be used to determine the organic and inorganic compounds present in all process wastes that come in contact with the environment.

(2) Routine Analyses. Routine analyses will be performed more frequently than screening analyses, and more accurate and precise analytical methods will be used.

Regulated pollutant parameters will be compared to applicable regulations for appropriate media. Unregulated pollutants important for environmental and health reasons have been selected by comparing reported concentrations in various solids, liquids, and gases from other oil shale processes with minimum acute toxicity effluent (MATE) values as reported by the EPA (Multimedia Environmental Goals for Environmental Assessment, 1977). If the maximum reported concentration in the screening analysis of process waste exceeds the published MATE, that parameter will be considered for routine monitoring under the first-phase program. In addition to comparing data to MATEs, final selection will be based upon informed toxicological judgments.

A MATE is an approximate concentration for contaminants in source emissions to air, water, or land that will not evoke significant harmful or irreversible responses in exposed humans for short-duration exposures (less than 8 hr/day). At the time MATEs were developed (i.e., 1977), they were based on threshold limit values established by the American Conference of Governmental Industrial Hygienists (ACGIH), National Institute for Occupational Safety and Health (NIOSH) maximum concentrations for workroom air, drinking water regulations, water quality criteria, radiation regulations, and lethal and toxic dose information from animal studies and from human exposures. MATEs have been calculated and compiled for some 600 chemical substances anticipated from synthetic fuel plants.

It is expected that these procedures will yield a reasonable list of parameters for routine first-phase monitoring. The screening analyses will be augmented by measuring indicator parameters discussed in subsection 4.3.3 during routine first-phase monitoring that are representative of broad classes of compounds suspected to be present in oil shale wastes and which may contain toxic and carcinogenic compounds.

The sampling frequency for each waste will be determined by evaluating the probability of release or worker exposure; plant operational phase (normal, emergency); source of waste (process, nonprocess); and type of analyses (screening, routine). The principal factor in setting monitoring frequency is the likelihood that the waste will be present in the environment at concentrations of significant environmental and health concern. All facility wastes will be categorized according to whether they are contained, exposed, or discharged, and a sampling frequency will be established ranging from zero for contained wastes to high for discharged wastes.

The source of waste within the plant is also important in setting sampling frequencies. Process wastes require more extensive monitoring than nonprocess wastes. Accordingly, in the first-phase program, the emphasis will be placed on process wastes.

Plant operational condition also will determine sampling frequency. Monitoring will be carried out during normal and emergency (upset, startup, shutdown) plant operation. Because of the transient nature of upsets, startup, and shutdown, more frequent monitoring will be required during emergency conditions than during normal operation.

To ensure that there are time-equivalent data for normal plant operations, one or more special sampling periods during normal operation will be conducted in which the same sampling frequency used in emergency conditions is employed. This will allow direct comparison of data under various operational conditions.

Finally, the type of analyses must be considered in setting frequencies. Screening analyses will use analytical methods capable of multi-element or multi-compound analyses and will generate large quantities of data. Some constituents will be accurately measured, while others will not be because of matrix and other interferences. Because of the volume and relatively poor quality of these data, screening analyses should be performed much less frequently than routine analyses, which use more accurate analytical methods to measure substances with a high probability of being incorporated into the second-phase program.

B. First-Phase Implementation

The proposed program will span a minimum of 1 year of plant operation and will include monitoring during normal operation and startup (subsequent to initial startup), shutdown, and upset conditions. The program will include two (semiannual) 5-day intensive sampling sessions to determine the composition

of steady-state waste streams, sampling of waste streams at specified periodic intervals throughout the 1-year period, and accelerated sampling during emergency conditions (startup, shutdown, upset). The same sampling points selected for compliance testing will often be used for the supplemental program. However, it may be necessary to add several new sites to facilitate evaluation of pollution control facilities performance. Separate samples may have to be taken for some pollutants because of special sample handling, preservation requirements, and large volume requirements. It is recommended that 8-hr composite samples be taken for most wastes to minimize variability caused by plant operation, to approximate the exposure received by onsite workers, and to provide large-volume weighted (flow or mass) samples.

Liquids and solids will be sampled using conventional methods. It is recommended that proportional sampling devices be used to collect 8-hr composite samples of high-volume process wastes (solids and liquids). Gases will be collected in impinger trains or on adsorbents for trace element analyses and adsorbed onto resins for trace organics analyses. Both adsorbents (e.g., precleaned coconut charcoal) and impinger trains will be used on at least 10% of the samples from the screening program for gaseous trace element analyses. This is necessary because neither collection method will efficiently trap all elements suspected to be present (e.g., arsenic,

bromine, chlorine, chromium, molybdenum, selenium, mercury, and fluoride). Particulates will be collected from gas streams onto an appropriate filter paper (e.g., quartz fiber) contained in stainless steel holders or by cascade impactors and handled and analyzed as for the other solids.

Parameters tentatively selected for routine first-phase monitoring in gaseous, liquid, and solid waste are summarized in Table 4-4 and include all inorganic consent-decree parameters (liquid effluents only) that are not specifically regulated under other federal or state statutes and which would otherwise not be selected for routine monitoring.

Proposed sampling frequencies as a function of waste stream, operating conditions, and type of analyses are summarized in Table 4-5.

The analytical methods proposed and associated parameters presently being considered for the first-phase Supplemental Monitoring Program are summarized in Table 4-6.

Table 4-4 - Supplemental Monitoring Parameters Anticipated for First-Phase Routine Monitoring in the Source Program

Parameter	Liquid Effluents	Gaseous Effluents	Solid Wastes
<u>Inorganics</u>			
Ag	M, S		
Al			M
As	M, S	S	M
B	M		
C, inorganic	M		M
Ca	M		M
Cd	M, S	M	M
Cl	C, S		
CN	S		
CO		S	
CO3	C		
Cr	S		
Cu	M, S		C
F	M		
Fe	M, S		M
H2S		S	
HCO3	C		
Hg	M	M	
K	M		M
Mg	M, S		M
Mn	M		C
Na	M		M
Ni	M		M
NH3	M	M	
Pb	M, S		
pH	C, S		
S2O3	C, S		
Sb	M		
SCN	C		
Se	M, S	M	
Si			M
SO4	C		
TDS	C, S		
V	M		M
Zn	M, S		C
<u>Organics</u>			
Organic C	C, T	C*	C
Organic C, HPO/HPI	C, T		
Organic N	C, S	C*	C
Organic S	C	C*	C
COD	T		

<u>Notes:</u>

M = Parameter selected because maximum reported literature concentration exceeds MATE.

S = Parameter also regulated by a standard.

C = Parameter selected to provide general background chemistry.

T = Parameter selected to evaluate performance of treatment systems.

* = Measurement to be performed on particulates only.

Table 4-5 - Proposed Sampling Frequencies for Regulated and Unregulated Pollutants in the First-Phase Supplemental Monitoring Program

Waste	Screening Analyses	Routine Analyses
<u>Emergency Conditions</u>		
Contained	One grab sample during any emergency that involves leakage from containment. Sample only at site of emergency.	One grab sample during any emergency that involves leakage from containment. Sample only at site of emergency.
Exposed	One composite sample during each emergency condition.	One composite sample during each emergency condition.
Discharged	One composite sample for each emergency condition of 2 days or less and two for emergencies longer than 2 days.	Daily composite samples for duration of condition up to, but not to exceed, 5 days.
<u>Normal Conditions</u>		
Contained	No sampling.	No sampling.
Exposed	One composite sample during each of two 5-day sampling periods.	One composite sample during each of two 5-day sampling periods and quarterly at all other times.
Discharged	Two composite samples during each of two 5-day sampling periods and quarterly at all other times.	Daily composite samples during each of two 5-day sampling periods and every other month at all other times.

Table 4-6 - Analytical Methods Suggested for Supplemental Monitoring

Method[1]	Waste Streams	Parameters[2]
<u>Screening Analyses</u>		
SSMS	Liquid effluents Impinger solutions Solids Particulates Charcoal adsorbents	Al, Sb, As, Ba, Be, Bi, B, Br, Cd, Ca, Ce, Cs, Cr, Co, Cu, Dy, Er, Eu, F, Gd, Ga, Ge, Au, Hf, Ho, In, I, Ir, Fe, La, Pb, Li, Lu, Mg, Mn, Hg, Mo, Nd, Ni, Nb, Os, Pa, P, Pt, K, Pr, Rh, Re, Rb, Ru, Sm, Sc, Se, Si, Ag, Na, Sr, S, Ta, Te, Tb, Th, Tl, Tm, Sn, Ti, W, U, V, Yb, Y, Zn, Zr
GC/MS	Extracts of liquids, solids, particulates, and adsorbents used to trap gases	Volatile and semivolatile organic compounds including benzenes, indanes, indenes, naphthalenes, benzoic acids, aldehydes, ketones, phenols, furans, nitriles, amines, pyrroles, pyridines, quinilines, thiophenes, and polynuclear aromatic compounds
<u>Routine Analyses</u>		
XRF	Solids Particulates	Al, As, Ca, Cu, Fe, K, Mg, Mn, Na, Ni, Si, V, Zn, Sr, Th[a]
ICPES	Liquid effluents	Ag, V, Cd, Pb, Sb, Na, K, Mg, Ca, Ni, Cu, Zn, B, As, Se, Fe, Li, Rb, Sr, Ba, Ti, Mn, Al, Ga, Mo, W, Co[a]
Ion Chromatography	Liquid effluents	S2O3, SO4, F, Cl, SCN
Specific Ion Electrode	Liquid effluents	CO3, HCO3

Table 4-6 (Contd)

Method[1]	Waste Streams	Parameters[2]
Standard Methods[3]	Liquid effluents	Inorganic C, COD, NH3, pH, TDS, organic C, organic N, HPO/HPI carbon, CN, oil and grease, BOD
Online GC	Gases	H2S, CO, NH3
Adsorption onto Au-plated beads (Hg) or charcoal (As, Se, Cd) followed by flameless AA analysis	Gases	Hg, As, Se, Cd
Other instrumental methods	Liquid effluents and solids	Hg, organic S
	Solids	Organic C, S, N

[1]Methods may be changed subject to further analyis and new developments.

[2]Not all parameters listed here are required for the routine analysis program. Since XRF and ICPES are multielement methods, they produce more data than are required at no additional cost. These extra analyses will be used to help validate analytical methods but will not be otherwise reported.

[3]Modifications of the Standard Methods reported by Daughton (1982) and Persoff, et al. (1983) are recommended for organic and inorganic C, COD, NH3, and organic N.

Notes:

SSMS = Spark source mass spectrometry.
GC/MS = Gas chromatography/mass spectrometry.
XFR = X-ray fluorescence spectrometry.
ICPES = Inductively coupled plasma emission spectrometry.
HPO = Hydrophobic organic carbon.
HPI = Hydrophilic organic carbon.
AA = Atomic absorption spectroscopy.

All of the analytical techniques will be thoroughly evaluated prior to development of the Source Monitoring Plan. Because oil shale wastes may be difficult to analyze, the proposed analytical methods must be tested, as necessary, prior to implementing the monitoring program. This will enable the project sponsors and WRSOC to identify problem areas and determine solutions before beginning the program. Hence, the techniques, parameters, and frequencies discussed in Tables 4-5 and 4-6 are subject to change as more information becomes available and new developments in analytical techniques are commercially proven.

In the screening analytical program, liquids and solids may be analyzed by spark source mass spectrometry (SSMS) and gas chromotography/mass spectrometry (GC/MS) or other appropriate methods. Liquids include effluents and impinger solutions (used to trap gaseous species); solids include solid wastes, particulates, and charcoal used to adsorb gaseous trace elements.

SSMS has been used for screening oil shale wastes, and there are several commercial laboratories in the Rocky Mountain region that have experience in applying this technique to oil shale wastes. This technique allows simultaneous determination of approximately 80 elements in most solid and liquid samples with a minimum of matrix effects, special

overlap, or interelement interferences. Precision typically is 50% or less for most elements.

Volatile to semivolatile organic compounds will be determined in all liquids, solids, and gases using GC/MS. This technique has been extensively used to characterize organics in oil shale waste and the analyses can be performed at many commercial laboratories. Liquid and solid samples will be serially extracted at acidic and basic pHs with methylene chloride and the extracts pooled, concentrated, and dried. Gases will be collected by adsorption onto Tenax GC or XAD-2 resins, eluted with normal pentane, concentrated and evaporated, and directly analyzed by GC/MS. Organic compounds will be identified by manual and computer-assisted matching of molecular fragmentation patterns of observed pollutants with those of standard compounds.

In routine analyses, elemental abundances will be determined in solids by XRF and in liquids by ICPES. Anions and cations will be determined by ion chromatography. These techniques have been applied to oil shale wastes. They are relatively inexpensive and commercially available. Various indicator parameters will be used for organic substances.

ICPES can be used to determine individual elements or up to 20 elements simultaneously, and detection limits of 1 to 5 ppb

are possible for many elements. Precision is typically less than 10%. This technique will be used for routine monitoring of most trace elements in liquid effluents.

XRF has been widely used to measure oil shale solid wastes and has been found to yield precise and accurate results when applied to raw and spent shales. The technique is commercially available in a number of laboratories. XRF typically measures 30 to 40 individual elements simultaneously by bombarding a pulverized and compressed sample with radiation and measuring the intensity of emitted radiation. This instrumentation typically is used to measure tin and heavier elements that produce high-energy (greater than 4.5 keV) X rays. It will be used for routine monitoring of most of the trace elements found in process solid waste and fugitive particulates.

Ion chromatography is being used in many laboratories to measure anions and cations in oil shale wastes. The method uses classical ion exchange principles to separate species, which are quantified by their conductivity as they emerge from the column. Since the species are separated prior to analysis, this method is less susceptible to chemical interferences that plague standard wet chemical techniques. The technique also essentially simultaneously analyzes several species, reducing analytical time and cost compared to

analysis by Standard Methods for the Examination of Water and Wastewater (APHA - AWWA - WPCF, 1975). This technique will be used to monitor sulfur species, fluoride, and chloride in liquid effluents.

The presence of organic substances will be routinely monitored using indicator parameters such as organic nitrogen, organic sulfur, and hydrophobic (nonpolar) and hydrophilic (polar) organic carbon. These general organic fractions, particularly hydrophobic carbon and organic nitrogen, contain the majority of the biologically active compounds.

C. Quality Control

Accuracy of measurements is assessed using alternative methods to analyze the same sample and running different dilutions on a limited number of samples.

The screening and routine analytical programs use different analytical techniques to measure many of the same parameters. At least 10% of the screening and routine measurements will be made on the same sample to provide a check on accuracy. This will be achieved by collecting large-volume composite samples at selected intervals and aliquoting them before shipment to analytical laboratories. If discrepancies greater than 50% in analyses from two techniques are noted, an effort will be made to identify sources and substitute alternative methods.

Trace elements in gases represent the most difficult collection problem because of the complex sample matrices (high-organic background and low-trace element concentrations). This collection problem will be addressed by collecting at least 10% of the samples from the screening program by two separate methods; e.g., impinger trains and coconut charcoal.

Many liquid samples included in this program are subject to chemical and other interferences. The occurrence of these types of problems can be assessed by running serial dilutions of a sample. The serial dilution technique will be used on at least one sample of each type of liquid effluent early in the analysis program. If serious analytical problems are detected, an effort will be made to substitute a more accurate method.

4.3.2 SECOND-PHASE MONITORING

The purpose of the second-phase program is to monitor those substances which are present in concentrations of significant environmental or health concern, while reducing monitoring costs. Parameters will be selected by analyzing the first-phase data using techniques described here. Anticipated modifications in monitoring include parameters measured, sampling sites, sampling frequency, and analytical methods.

The general procedure that will be used to select parameters for second-phase monitoring was shown in Figure 4-1. The screening and routine analyses from the first phase will be analyzed, and a preliminary second-phase program will be developed. This preliminary program will be carried out for 3 to 6 months, and the resulting data analyzed to evaluate efficiency of the second-phase program. Additional modifications will be made as required in the second-phase program following this analysis.

All data collected in the first-phase and preliminary second-phase monitoring programs will be analyzed using pattern recognition techniques. The purpose of this evaluation is to improve the information feedback loops shown in Figure 4-1. This technique will be used to evaluate sampling frequencies, number and location of sampling sites, adequacy of analytical techniques, and parameter selection. Based on this analysis, the first-phase and preliminary second-phase monitoring frequencies, sampling sites, analytical methods, and parameters will be modified to produce a final second-phase monitoring program. The general procedure that will be used to identify preliminary second-phase parameters that are thought to be of significant environmental or health concern is summarized in Figure 4-2.

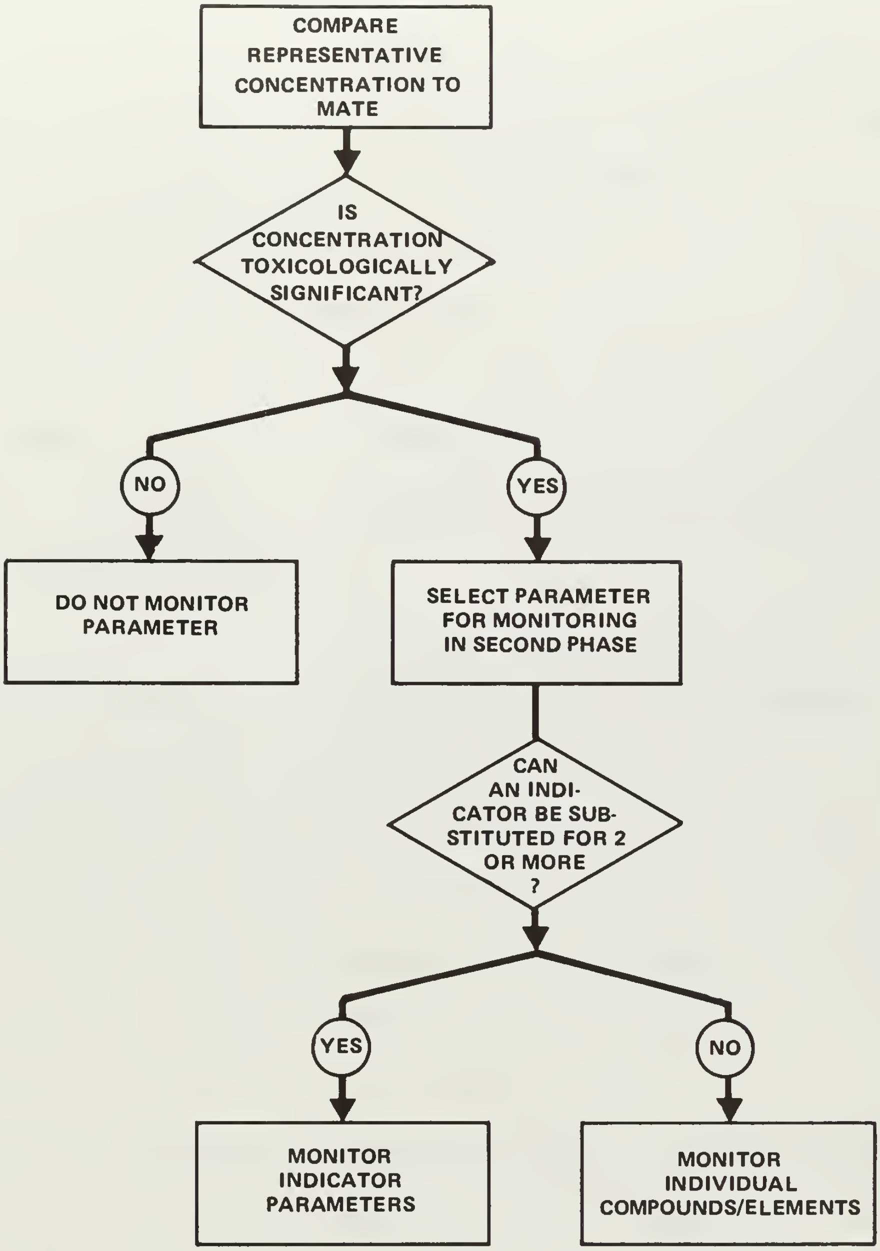

Figure 4-2 - Parameter Selection Procedure
for Second-Phase Supplemental Monitoring Program

This general procedure for selecting parameters for monitoring in the second phase will be supplemented by the use of indicator parameters. The indicator parameter approach involves the use of one or more compounds or elements that are representative of a broad class of compounds. This is particularly suited to organic pollutants since these generally occur as homologous series in oil shale wastes. Rather than monitoring an entire series of compounds, a single compound from a class of such compounds occurring at high concentrations will be selected for monitoring. For example, pyridine or an alkylpyridine may be selected as the indicator for pyridines while phenol or cresol may be selected as the indicator for phenols.

Sampling frequency will be modified to reflect the variability in each waste observed in the first-phase program. Highly variable wastes will be monitored more frequently than those that are relatively uniform over time. Otherwise, considerations discussed in the previous section regarding sampling frequency or results of the pattern recognition analyses will be followed.

The number of sampling sites will be reduced. Wastes that contain no pollutants of environmental or health concern will not be monitored in the second phase. Upstream sampling sites used initially to verify control technology performance may also be reduced.

There also will be a shift from analytical methods that are capable of multi-element and multi-compound analysis to those that perform single element or compound analysis. The new methods will be selected to optimize accuracy, precision, and cost.

SECTION 5
QUALITY ASSURANCE/
QUALITY CONTROL PROGRAM

SECTION 5

QUALITY ASSURANCE/QUALITY CONTROL PROGRAM

The WRSP quality assurance/quality control (QA/QC) program will be developed to ensure that process stream data that are collected and analyzed are representative of the respective process stream; are complete, precise, and accurate; and are comparable among other streams and within the same stream. Three basic stream types compose the WRSP processing systems: gaseous, liquid, and solid streams. Methods of QA/QC promulgated by the U.S. EPA and other regulatory agencies, as applicable, will be used to develop the WRSP program. Certified laboratories will be used as required to perform selected analyses. Contract laboratories will be selected based upon their experience with oil shale. The following subsections contain a general discussion of the WRSP gaseous, liquid, and solid processing stream QA/QC program.

5.1 INTERNAL CHECKS

Internal checks will be implemented as part of the QA/QC program in the following areas: personnel, field and laboratory instrumentation and procedures, data handling, and document control.

5.1.1 PERSONNEL

A successful QA/QC program requires qualified professionals who are trained in the proper procedures. These professionals will be supervised and monitored by qualified senior personnel to ensure adherence to QA/QC procedures and to guarantee quality work. The monitoring program will also be designed in a subjective manner to eliminate variance and bias between personnel as much as possible.

5.1.2 INSTRUMENTATION AND PROCEDURES

Standard operating procedures for laboratory and field operations will be established. Preventive maintenance of equipment will be emphasized. The QA/QC program will also encompass appropriate sample-collection procedures; correct field analysis, field processing, and preservation of samples; and correct packing and shipping of samples. Proper chain of custody checks will be included. Laboratory and field instruments will receive regular span and zero checks, precision checks, and calibrations. Calibration standards will be used when appropriate, as well as control and replicate sample analyses. Calibration/standardization records for all instruments, including compilations of standardization procedures, will be kept in historical files. Certified calibration samples will be used as required.

5.1.3 DATA HANDLING

All nontransportable data, such as flow rates, temperature, etc., will be kept in permanent field notebooks. The notebooks will be reviewed and approved by supervisory personnel, and stored in permanent project files. Precision and accuracy checks of raw data will permit adequate defense of data and conclusions.

All original data sheets will be stored in permanent project files. Data will also be transferred to and stored on computer disk or tape. High-quality data will be ensured by the use of coding forms designed for ease of use by personnel and ease of

data entry to computer formats, and by checks against original and output data. Maximum inactive data verifications will be made for data error recognition. Computer software and data management systems will be designed to ensure consistency and to maintain accurate data records.

5.1.4 DOCUMENT CONTROL

Document control involves coordination and control of project records to ensure accuracy, retrievability, and traceability of records. Project records include original data; results of calculations and analyses; and final figures, tables, graphics, and text used in or as a reference to technical reports. Written procedures for document control will be established and reviewed on a regular basis to ensure compliance. As another aspect of document control, all QA/QC procedures will also be field tested and reviewed regularly for compliance.

5.2 CORRECTIVE ACTION

Procedures will be established for reporting any problems discovered as a result of carrying out internal checks. Corrective actions resulting from such procedures will be documented, and placed in the project files. The QA/QC program will include methods that will be implemented when corrective actions are taken to help prevent recurrences of similar problems. If problems arise that preclude comparison of data with previous test results, further action will be taken to bring analyses

back in confor-mance with previous results so that the continuity of the program may be maintained.

5.3 DATA VALIDATION

Methods for routine data quality control and validation will be established as part of the QA/QC program. Procedures for problem investigation will be included. All data will be verified by supervisory personnel. Data files will be proofed by computer programs that check for syntactic errors in data. Results of precision and accuracy of data collection, analysis, and reporting will be generated for each parameter studied, and will be maintained in the project files.

5.4 REPORTING

Reporting of results will come under the direct supervision of qualified project management. A review system will be established by the QA/QC program, which will cross-check results and conclusions. Professional experts will be consulted, as necessary, to verify significant information.

5.5 AUDITS

Periodic, scheduled surveillance of project staff, laboratory and field activities, and other project activities will ensure that the work is accomplished according to established project procedures and regulatory guidelines and standards. Collection and analysis procedures will be designed to facilitate verification of data. Sufficient backup information and references will be obtained to demonstrate traceability of

results and conclusions. Procedures will be allowed for in the QA/QC program for third-party review of methods and procedures and for participation in the U.S. EPA National Performance Audit Program, as applicable. The results of the overall audit program will be documented in periodic audit reports.

SECTION 6
DATA MANAGEMENT AND ANALYSIS

SECTION 6

DATA MANAGEMENT AND ANALYSIS

Figure 6-1 is a block flow diagram of data management and analysis that may be referred to during the following discussion. The WRSP System will be designed to be compatible with EPA, DOE, and other applicable data management systems.

6.1 DATA INPUT

Automatic sensors of gaseous, liquid, and solid parameters will be linked directly to computers, when possible, for automatic recording. Field logs of manually collected data will be duplicated and checked the same day as collected, or as soon thereafter as possible, to eliminate errors or add to any incomplete data while they are fresh in the observer's mind. Manually collected data will be digitized, if needed, and loaded into computers. Laboratory results will also be checked, digitized as necessary, and loaded into computers.

Data from all computer inputs will be merged and recorded on magnetic tape and/or disk. Original field logs, laboratory results, etc., will be placed in permanent files for backup. Data stored on computer tape or disk will be subjected to the QA procedures described in Section 5. Computer printouts will be checked against backup hard copies. Computer files will be proofed by programs that check for errors. Command structures will be developed that will supervise entry verification and processing of categories of data, and software and data management will be designed to ensure consistency and accuracy.

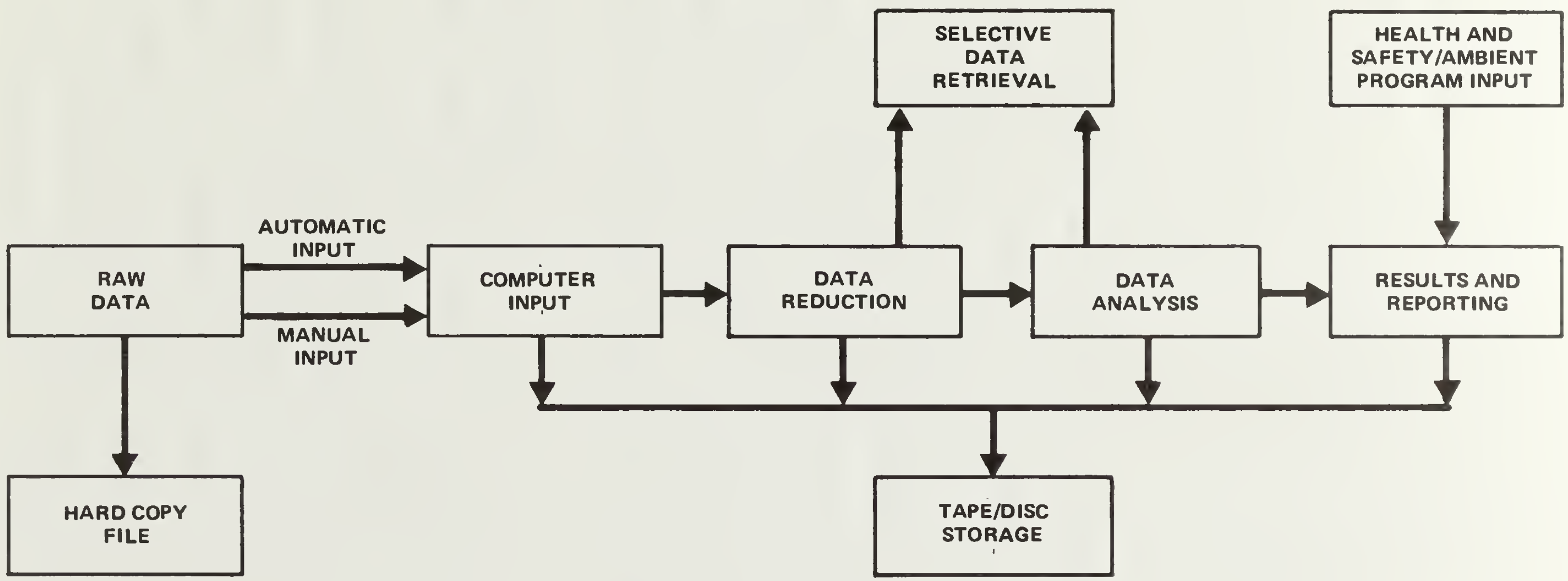

Figure 6-1 - Data Management and Analysis
Block Flow Diagram

6.2 DATA REDUCTION AND ANALYSIS

The data base will be interfaced with computer programs that will summarize the data and prepare them for appropriate statistical analysis, tables, figures, and other intermediate formatting or data outputs, as required. The system will be designed for selective data retrieval that will retrieve data on any combination of parameters for any specified time period.

The selection of appropriate statistical analyses will be made to ensure proper interpretation of data sets. Tests of means, analyses of variance, and cluster analyses may be conducted on single parameters to investigate data similarities and differences. Relationships between parameters may be determined by single and multiple regression, analysis of variance (ANOVA), cluster analyses, factor analyses, and parametric and nonparametric tests of means. Correlation matrices may be used to generate hypotheses to test for significant relationships between data.

6.3 PRESENTATION OF RESULTS

Analyses source monitoring data will be contained in annual reports. Additionally, semiannual coordination meetings will be held with the SFC and other associated agencies to review and discuss the source monitoring program. Results will be presented graphically, when possible, to visually identify any trends in the data and to compare the data with regulatory requirements and standards. Examples of graphic data presentations are X-Y analyses, bar graphs, and mean separation graphs for presentation of statistical results. The data will also be summarized

in tables if doing so would be useful. One of the main objectives of the graphic and written results will be to present the data relative to regulatory limitations.

The results will be used to assist in the two-phased approach proposed for monitoring of unregulated pollutants. The first phase will employ screening analyses to identify substances of environmental and health concern, and to assess the performance of WRSP environmental control systems. Results of the first phase will be used to limit the scope of the monitoring program to provide data only on those substances of significant envi-ronmental or health concern, and to reduce monitoring costs. This will lead to a modification of the parameters measured, sampling sites, sampling frequency, and analytical methods.

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WHITE RIVER SHALE PROJECT

"RESPONSE TO COMMENTS RECEIVED ON THE DRAFT SOURCE MONITORING PLAN OUTLINE, DRAFT HEALTH AND SAFETY MONITORING PROGRAM OUTLINE, AND AMBIENT MONITORING PLAN SUBMITTED IN ACCORDANCE WITH U. S. SYNTHETIC FUELS CORPORATION GUIDELINES FOR ENVIRONMENTAL MONITORING PLANS"

submitted to:

U. S. SYNTHETIC FUELS CORPORATION
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Washington, D.C. 20586

prepared by:

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November 23, 1983

INTRODUCTION

The following responses are being made to comments received from the U. S. Department of Energy, the State of Utah Division of Environmental Health, the U. S. Department of Health and Human Services, and the U. S. Environmental Protection Agency concerning the Environmental Monitoring Plan Outlines prepared for the White River Shale Project (WRSP). The documents under review were prepared by the White River Shale Oil Corporation as agent for the WRSP project sponsors, in accordance with guidelines adopted by the U. S. Synthetic Fuels Corporation and include the Draft Source Monitoring Plan Outline, the Draft Health and Safety Monitoring Program Outline, and the Ambient Monitoring Plan.

DEPARTMENT OF ENERGY (DOE) COMMENTS

COMMENT:

"We recommend that the outline be revised to identify all environmental permits for the project that are obtained, pending, or considered by the sponsor to be potentially applicable, and that the outline identify the monitoring requirements (parameter, location, method, and duration) of each permit. Perhaps this could be done in tabular form for each monitoring area."

RESPONSE:

WRSOC has prepared a list of all permits obtained to date and the monitoring requirements associated with each. In addition, the list also addresses those permits applicable to the project but not yet secured by WRSOC. This information has been incorporated into the revised Source Monitoring Plan Outline (SMPO) as Appendix A.

Very few monitoring requirements are actually associated with the 105 separate permits, approvals and notifications obtained to date for the WRSP. Consequently, it was often necessary to make assumptions concerning anticipated permit monitoring requirements in order to develop the Compliance Monitoring section of the SMPO. Pages 4-4 and 4-5 of the SMPO discuss this situation.

Specific locations, methods and durations for all monitoring requirements are not available at this time. However, this information will be provided in the Environmental Monitoring Plan.

COMMENT:

"It would be useful to include a summary of baseline air quality data for regulated pollutants, a summary of meteorological data collected at the site, and a brief review of the climate of the site.

"The Ambient Outline could be improved by providing a brief site description which includes regional and local characterization of geology, hydrology, water quality, etc. It would be especially useful to know the mean flow of the White River in the vicinity of the project, the seasonal flow characteristics, and a general characterization of water quality conditions. Also such a site description could provide details about the proposed White River Reservoir which is mentioned in the text."

RESPONSE:

The Preface to the Source Monitoring Plan Outline and the Health and Safety Monitoring Program Outline has been modified to incorporate by reference the following documents: The Final Environmental Baseline Report (Oct., 1977) and the WRSP Detailed Development Plan, Section 2.0 (Aug., 1981). These documents will provide the details requested in the above comment. Annual updates have also been published for the WRSP Ambient monitoring program. Please note that copies of these documents were distributed to DOE, EPA and the State of Utah at the time of their initial publication. Because of the large volume of material represented by these documents, WRSOC does not feel that they should be an actual part of the Outlines.

As a reminder, the Ambient Monitoring Program submitted as requested by the SFC is considered by the project sponsors and the WRSOC as a final monitoring plan, not an Outline. It has already undergone substantial review by government agencies, been approved, and is being implemented in the field. Hence, changes in the plan will come in response to data collected under the program and not in response to comments received during this review.

For details about the proposed White River Reservoir, WRSOC suggests that requests for information be submitted to the State of Utah. The State of Utah has sole responsibility for the design, construction, operation, and impact mitigation for the proposed reservoir.

COMMENT:

"It would be useful if the outline indicated the approximate duration of each monitoring activity as related to project development activities. For example, Figure 1-5 (page 1-16) of the Source Outline illustrates the Phase I Project Timetable but it includes only one time line for all monitoring activities. Preparing a similar schedule for at least the major components of the monitoring program (e.g., source, ambient, health and safety, etc.) would provide meaningful information."

RESPONSE:

As requested, Figure 1-5 (page 1-16) of the SMPO has been modified to include separate time lines for the source, ambient and health/safety monitoring programs.

As indicated in the revised Figure 1-5, the Source and Health/Safety Monitoring Programs will begin in the last quarter of 1988 coincident with the start-up of processing facilities. During the initial mine development period, WRSOC will continue to comply with all applicable Mine Safety and Health Administration (MSHA) monitoring requirements. MSHA monitoring during this period is indicated by a dashed time line on Figure 1-5.

COMMENT:

"Assessing the coverage of the planned source and ambient monitoring programs is difficult because the spatial relationship between project activities and monitoring locations is unclear. Therefore, we recommend that the locations of project facilities, disposal sites, etc., be indicated on a map that also locates the various streams and monitoring points."

RESPONSE:

For the SMPO, all source monitoring points will be located within the area depicted on Figure 1-4 with the exception of monitoring points associated with the processed shale disposal pile, including the runoff/leachate collection pond, and a possible hazardous waste disposal site. The processed shale pile location is shown on Figure 1-2. As described in Section 1.4.6.C, plans and a location for hazardous waste disposal will be developed when the types, characteristics and amounts of hazardous waste have been defined. As discussed in our response to a previous comment, specific locations for various source monitoring points have not yet been developed. WRSOC does not feel that this information is needed for the SMPO. However, it will be provided as part of the final plan.

For the ambient monitoring program, enclosed with these comments is a mylar overlay of an overall plot plan of the Phase I WRSP which can be used with the monitoring station location figures in the ambient program. This overlay places into perspective the location of the monitoring stations versus project development plans.

COMMENT:

"It would be helpful if the following information is provided in the Source Monitoring Outline:

- o the likely composition of the raw and processed shale, and the syncrude expected to be produced; and
- o the likely composition of the runoff from the sulfur storage area."

RESPONSE:

A summary of the "likely" composition of retorted shale and raw shale has been added to the SMPO as Table 3-1. The anticipated composition of synthetic crude has been added to the SMPO as Table 3-2.

The likely composition of runoff from the sulfur storage area is not currently defined, however, it will be acidic. Provisions for reducing run-on into the area, collection and retention of runoff from the storage area, and neutralization of collected runoff will be implemented for Phase I of the WRSP. Section 3.2.1 of the SMPO has been modified to address these provisions (see page 3-8).

COMMENT:

"The following change is recommended on page 1-11: 'The major goal of supplemental source monitoring is to document the presence or absence of certain unregulated substances in concentrations...,' to 'The major goal of supplemental source monitoring is to identify and characterize the nature and magnitude of unregulated substances which may be present at significant levels of health and environmental concern'."

RESPONSE:

Page 1-11 of the SMPO has been modified to read as follows: "The major goal of supplemental source monitoring is to document whether certain unregulated substances exist in concentrations suspected of causing carcinogenesis, matagenesis, teratogenesis, reproductive effects, or other systemic disorders and environmental effects." WRSOC believes that this goal is consistent with the intent of the SFC Environmental Monitoring Plan Guidelines published in the October 13, 1983 Federal Register.

COMMENT:

"Consideration could be given to including some initial monitoring of the ventilation gases from mine exhausts rather than relying on ambient results (page 4-2, Table 4-1) to more readily detect concentrations of any potentially toxic materials."

RESPONSE:

WRSOC has considered the possibility of monitoring the ventilation gases from the mine exhaust. The mine ventilation air will exhaust through a 30 foot diameter shaft at an exit flow rate of approximately 3,000,000 cubic feet per minute. In our opinion, monitoring such a source is not possible using currently proven monitoring techniques. Also, the extremely large volumes of ventilation air required for the Phase I mine would effectively reduce concentrations of any potentially toxic compounds to levels below reasonably expected detection limits.

Regulations and standards applicable to mining operations are mandated by the Mine Safety and Health Administration (refer to 30 CFR Par 57). Air quality, ventilation, radiation and physical agents are covered in Section 57.5 of these regulations. Further, control technology requirements for underground sources will be mandated by final approval orders issued by the Utah Bureau of Air Quality associated with the Prevention of Significant Deterioration (PSD) permit for the project. Consequently, compliance testing as required by MSHA and the PSD permit will assure compliance with applicable requirements.

Considering the above, WRSOC feels that the current scope of the source, health and safety and ambient monitoring programs adequately addresses potential emissions of toxics from the mine, and no further monitoring should be required.

COMMENT:

"An indication of which solid waste streams are classified as non-hazardous process waste would be useful in determining the scope of proposed supplemental monitoring. Consideration could also be given to adding aqueous leach testing to this program to help identify contaminants that are most likely to be mobile in the environment and thus of greater health concern."

RESPONSE:

A summary of anticipated non-hazardous process wastes has been incorporated into Table 4-3 of the SMPO as footnote #2.

As indicated on Table 4-6 of the SMPO, consideration of the use of aqueous leach testing has been given for certain wastes. Details will be provided in the final source monitoring plan for the specific wastes for which aqueous leach testing is determined to be applicable.

COMMENT:

"On page 1-34, waste firebricks are indicated to be non-hazardous. Fire-bricks are exposed to retort off-gases or combustion of waste oils which could lead to extensive surface contamination with arsenic, etc. Materials exposed to a hazardous environment may be considered hazardous until otherwise indicated by monitoring results."

RESPONSE:

WRSOC agrees that the listing of waste firebricks as non-hazardous may be premature. Firebricks which come into contact with retort gas will be tested for determination of hazardous/non-hazardous status prior to disposal. Waste firebricks have been removed from the listing of non-hazardous wastes on page 1-34 of the SMPO pending confirmation of their true status.

COMMENT:

"It is not clear why the combustion gas composition from all five sources within the process area that fire fuel gas is "reasonably assumed" to be relatively uniform (page 4-7). Monitoring only the one source should be reconsidered in light of further justification."

RESPONSE:

As discussed on page 1-32 of the SMPO, plant fuel gas will be made by combining excess hydrogen from the hydrogen plant, treated fuel gas (i.e., retort make gas) from the Unisulf plant, and natural gas. These gases will be combined in a common fuel system and then distributed to the five combustion sources referred to on page 4-7 of the SMPO. Since all five sources will combust the same fuel gas mixture, it is reasonable to assume that the combustion gas composition from each source will be comparable in quality. Hence, there is no reason to monitor more than one of the five combustion sources.

COMMENT:

"By analogy to Stretford performance, we recommend that the discussion of Unisulf units (page 4-7) be amended to address the possibility that these units may be subject to such unexpected problems as biologically induced plugging. The comparative performances of the two trains is almost as important as the overall efficiency. We suggest that both trains be characterized for at least the first year. In addition, we recommend that the blowdowns from the Claus and Unisulf units be quantified and characterized for arsenic, antimony, selenium, etc."

RESPONSE:

To date, our discussions with Union Oil Co. concerning Unisulf performance have never indicated that the unit may be subject to biological plugging. However, should such a problem occur, it would be detected by the board instrumentation on the system (i.e., unexpected temperature increase, change in flow rates, change in pressure drop, etc.). Each Unisulf system will have identical board instrumentation. Hence, system performance of each unit will be recorded as part of the normal operating procedures. This is not discussed in the SMPO since WRSOC considers process operations a distinct subject separate from the purpose of the SMPO.

As discussed in the SMPO, inlet and exit gas from one Unisulf unit will be monitored to determine the ability of a properly functioning unit to remove H_2S from the gas stream. Once the H_2S removal capabilities of one unit have been demonstrated, any properly functioning unit can be expected to perform in a

similar manner. In addition, Table 4-1 of the SMPO indicates that the plant fuel gas (composed of Unisulf exit gases, excess hydrogen and natural gas) will be continuously monitored for H_2S and TRS.

As noted in Section 4.1.2 (page 4-9) individual waste water streams, such as "Claus and Unisulf blowdown", will be sampled if a significant problem is identified from sampling the combined waste water stream. Due to the large number and variety of blowdown and intraplant recycle streams, it is not cost effective to sample individual streams on a routine basis. We understand from Union Oil Co. that there will be no blowdown from the Unisulf units.

COMMENT:

"The treatment of the shale oil products could be improved in the outline because it is worker exposure to these products that presents the greatest concern for adverse chronic effects. Also, under shale oil handling in Table 2.1, we suggest that PNA's be added as a monitoring parameter."

RESPONSE:

The Health and Safety Monitoring Program Outline describes a program which will have the ability to collect and evaluate necessary data on worker exposure to shale oil products. WRSOC believes that the parameters listed on Table 2-1 adequately address the most likely sources for adverse chronic health effects. Health effects associated with direct contact with shale oil should be minimal because of infrequent exposure incidence and employee protection methods which will be employed whenever shale oil must be handled. The health information system as proposed in the program will provide sufficient information to allow an assessment of health risks and effects associated with each employee.

Polynuclear aromatics (PNA) have been added to the list of substances under the Oil Shale Handling Category on Table 2-1, page 2-6 of the Health and Safety Monitoring Program Outline.

COMMENT:

"The individual exposure report file (File 5 on page 2-13) gives the impression that all actual personal monitoring might (ultimately) be dispensed with and, if possible, rely instead on generalized exposures associated with job types. There are many unknowns and potential problems associated with measuring and interpreting worker exposure to shale oil. Therfore, it is recommended that the actual situation be carefully evaluated."

RESPONSE:

The Health and Safety Monitoring Program will develop individual exposure reports. These reports will largely be built upon personal sampling. This program would be diminished <u>only</u> after exposure risks have been carefully evaluated, understood, and properly controlled and after receiving the appropriate approvals.

COMMENT:

"We recommend that dermal exposure, either in terms of potential hazard or plans for monitoring be considered in the worker registry. Also, we suggest that it discuss whether or not individuals work only in one process, how unique job categories will be defined, and how personal and area monitoring will be linked to each unique job category."

RESPONSE:

Dermal exposure is part of the evaluation of exposure risk, and appears both in the toxicological profiling system as a target organ risk, and in the medical profile as a skin response. Similarly, skin exposures are delineated in the ACGIH Threshold Limit Values booklet, and are included as specific concerns in dealing with workplace inventories.

COMMENT:

"Document the rationale for aquatic issues presented on page 4-2 of the Ambient Monitoring document. This would support the decision, for example, to have contingency monitoring for heavy metals, but not organics, in aquatic biota."

RESPONSE:

The WRSP Ambient Monitoring program, is intended to track the impacts of project development and provide feedback to assist design and operations. This goal is to be achieved through a knowledge and understanding of both the "expected" impacts of project development and the structure and function of the affected environment.

The aquatic biology monitoring section, like the other major environmental monitoring disciplines, begins with a discussion of those project-related activities which may affect aquatic biology. The issues presented on page 4-2 reflect the generally small, subtle impacts the WRSP should have on the aquatic system. Our monitoring program is focused primarily on the quantification of such subtle impacts which could produce slow, yet possibly long-lasting, changes in the ecosystem.

Contingency monitoring in the aquatic system will be implemented only when the operational monitoring program identifies a change in the environment that is not "natural" or cannot be explained by other data collected by either the aquatics program or another monitoring discipline. Table 4.1-1 identifies the candidate parameters expected to be included in each level of monitoring. Heavy metals are included in contingency monitoring because a substantial data base exists for the several elements which could be significant indicators of change associated with the WRSP. Organics have not been included because of the large number of compounds which exist in the process streams and the lack of current data to indicate which, if any, of these compounds may enter the aquatic system as a result of the WRSP. To attempt to monitor for organics, even on a contingency basis, would be very expensive based on existing analytical technology. Consequently, organics monitoring is not presently contemplated in the aquatic biology program until more information is available from the source monitoring program.

STATE OF UTAH, DIVISION OF ENVIRONMENTAL HEALTH COMMENTS

COMMENT:

"Drinking water system monitoring or aquifer monitoring has not been mentioned. The company is referred to the Utah Public Drinking Water Regulations."

RESPONSE:

WRSOC currently has a potable water treatment plant on-site. Water from this plant is currently being tested on a periodic basis per Utah Public Drinking Water Regulations. This information is now contained in Appendix A (i.e., permit list with monitoring requirements) of the SMPO.

Aquifer monitoring has been addressed in Section 6 of the Ambient Monitoring Program.

COMMENT:

"The plan states that hazardous wastes will be generated but no specifics are given. Possible wastes include spent catalyst, leachate, sludges and solvents. White River Shale Oil Corporation is required to notify the State/EPA that they are or will be a generator of hazardous waste. A hazardous waste disposal plan will be required by the State. Also a solid waste disposal plan will be required to cover general refuse disposal if disposal on-site is the objective."

RESPONSE:

WRSOC intends to develop a hazardous waste disposal plan and the State/EPA will be contacted when the plan is developed. Hazardous waste disposal plans will be addressed in more detail in the final source monitoring plan.

WRSOC has already developed a solid waste disposal plan to cover general refuse disposal on-site. The Utah Bureau of Solid and Hazardous Waste issued a permit for WRSOC's solid waste disposal plan on September 30, 1982. This permit is listed in Appendix A of the Source Monitoring Plan Outline (SMPO).

COMMENT:

"Laboratories performing sample analyses should be approved by or certified by the State. Verified water quality data collected from monitoring sites should be entered on EPA's STORET system to provide data base expansion and availability."

RESPONSE:

The above comment has been noted by WRSOC. Water quality data is being collected and stored currently under the USGS WATSTOR system.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES COMMENTS

COMMENT:

"As noted in this Draft Plan, the design and engineering of the White River Shale Project are not completed. However, the Draft Plan contains no information on the projected socio-economic impact on northeastern Utah."

RESPONSE:

The SFC's Environmental Monitoring Plan Guidelines do not require that the socio-economic impact monitoring for a project be discussed. Nevertheless, WRSOC has addressed the impacts of the project on the social environment of northeastern Utah through a number of project-sponsored studies including:

- WRSP Financial Impact Statement and Alleviation Plan (Sept., 1982)
- WRSP Cost Revenue Study (Mar., 1983)

WRSOC has also conducted a Socio-Economic Monitoring Program since March 1982 (construction at the WRSP began in May, 1982). The monitoring program addresses items such as: the number of employees currently working on the project, where the employees live, marital status of employees, number of school age children associated with employees, housing preferences and recreational preferences, etc. In addition, WRSOC has also recently implemented a Housing Monitoring Program which tracks vacancy rates for housing, rentals, trailer parks, etc. These efforts have been voluntary on the part of the WRSOC and demonstrate our concerns for maintaining a high quality of life in the region.

WRSOC is currently involved in negotiations with the Uintah County Community Impact Council regarding the project's anticipated socio-economic impacts on the area. It should also be noted that all of WRSOC's Socio-Economic Programs have been developed in coordination with the BLM-Oil Shale Projects Office, the Oil Shale Environmental Advisory Panel, the State of Utah, and several local entities.

ENVIRONMENTAL PROTECTION AGENCY (EPA) COMMENTS

COMMENT:

"It is stated that 'only those process and waste streams that come into contact with the environment will be addressed by the supplemental program'. Waste water streams and various gaseous streams should be monitored prior to treatment and control equipment. These streams need to be characterized so that treatment and control performance can be evaluated. Monitoring of these streams will help identify those pollutants of concern which should be looked for in streams that come into contact with the environment."

RESPONSE:

The Supplemental Monitoring Program of the Source Monitoring Plan Outline (SMPO) addresses pollution control equipment performance. Sufficient data on system inputs and outputs will be collected to determine the performance of each unit with regard to its ability to remove those pollutants for which the unit has been designed. However, as a general rule, only those process and waste streams that come into contact with the environment (i.e., discharge streams) will be characterized according to the supplemental monitoring program described in Section 4.3 of the SMPO. Page 4-7 of the SMPO has been revised to clarify the philosophy discussed above.

COMMENT:

"Supplemental monitoring parameters should include Molybdenum. An improved discussion of the organic parameters to be monitored would be helpful."

RESPONSE:

Table 4-6, page 4-27 of the SMPO lists Molybdenum as one of the parameters which will be screened for as a part of the supplemental program. If the screening program detects significant quantities of Molybdenum, it will be added to Table 4-4, page 4-25 as a First-Phase Routine Monitoring parameter. Table 4-4 currently lists only "anticipated" First-Phase Routine Monitoring parameters, and as such, is subject to change as new information and/or results from the screening program become available (see page 4-24).

At this time, it is not possible to identify specific organic species which are likely to be discharged to the environment. However, it is planned to monitor basic classes of organic compounds (see Table 4-6) in the supplemental routine program and test for a wide variety of organic species in the screening analysis program. Once specific species are identified by the procedure described in the SMPO, these species would then be monitored in the routine program.

COMMENT:

"There are no good process flow diagrams indicating the emission streams and source emission monitoring points. The block flow diagrams of section one could perhaps be modified for this purpose. Emission and process streams described in the EMP (and outline) should be assigned unique numbers used throughout the

document. A table of these streams should then be provided for the reference of the reader. Refer to the oil shale pollution control technical manuals for one example of how this was accomplished."

RESPONSE:

Process flow diagrams indicating the emission streams and source emission monitoring points are not required as part of the outline according to the SFC's guidelines. SFC requires that only process block flow diagram be provided in the outline. Appropriate process block flow diagrams for the entire Phase I project can be found in Chapter 1 of the SMPO.

WRSOC will assign unique numbers to process streams, etc. when the information becomes available and the final source monitoring plan is developed.

COMMENT:

"The SFC guidelines require environmental monitoring during all stages of a project. Accordingly, the source program and ambient program should identify clearly which activities will be performed in specific phases of the project. Baseline, construction, operation, and post-operation stages should be considered. Monitoring of hazardous waste sites and other debris left behind must continue after plant shutdown to facilitate site reclamation."

RESPONSE:

Figure 1-5, page 1-16 has been modified to differentiate between the Ambient, Source, and Health/Safety monitoring programs. The Ambient program began in 1974 and will continue through all stages of the project, including abandonment. The Source and Health/Safety supplemental monitoring programs will begin when plant operation commences and continue for a minimum of one year. The extent of the Source and Health/ Safety supplemental programs will be dependent upon the data collected during the first year of the monitoring programs. Compliance monitoring will continue as required by lease and other applicable permit conditions. For instance, post-operation monitoring of on-site hazardous waste sites would be required by RCRA, while land reclamation activities will be conducted as part of the stipulations associated with Utah Division of Oil, Gas and Mining permit issued for the WRSP and the provisions of the Federal Prototype Lease for the WRSP property.

COMMENT:

"SFC guidelines require that the summary of monitoring requirements found in permits already obtained be included in the outline. Because no such permits are mentioned in the outline, it is assumed that WRSOC has not obtained any permits yet."

RESPONSE:

WRSOC has obtained 105 separate permits, approvals and notifications to date. A list of these permits and associated monitoring requirements has been included in the SMPO as Appendix A. Because so few of the current permits for the WRSP involve monitoring requirements, Section 4 compliance monitoring requirements were based upon our "best guess" concerning future monitoring requirements. This is clearly explained on pages 4-4 and 4-5. Since no comments

have been received taking exception to our projection of monitoring requirements, it is assumed that the projections are fairly accurate at this time. Of course, the final requirements will be based on actual permit conditions.

COMMENT:

"A material balance for the entire process is needed for meaningful evaluation of the environmental monitoring plan."

RESPONSE:

A material balance is not required to be included in monitoring plan outlines under the SFC Guidelines. In addition, a material balance for the entire process would be highly confidential material, and as such, could not be made part of a public document. Further, material balances typically do not contain information which would completely characterize discharges to the environment which are of interest in environmental monitoring plans.

COMMENT:

"A Glossary of Acronyms used throughout the document would be helpful."

RESPONSE:

A glossary of acronyms has been prepared for the SMPO and is now contained in Appendix B.

COMMENT:

"Characterization of volatiles emitted from the segregated portion of the retention pond and possibly from the wetted processed/fines shale piles does not seem to be addressed. The ambient monitoring focuses on SO_2, NO_x, CO, O_3, TSP, and IP so it will not provide this information. This suggests that some supplemental ambient monitoring in addition to supplemental source monitoring may be needed, at least sometime during the early operation of the facility. In this connection also, characterization of POM on inhalable particulate is suggested even if not a permit requirement."

RESPONSE:

WRSOC is currently re-evaluating the need for storage of reuse waters in a segregated portion of the runoff retention pond. Consideration is being given to storing process waters in a tank(s) within the process area prior to reuse within the process. A final decision has not yet been made. Hence, all specific references to the segregated portion of the runoff retention pond have been removed from the SMPO and replaced with the words "reuse water storage facility".

In any event, the Health/Safety Monitoring Program will address the question of monitoring volatiles emitted from any facility storing process waters as well as any volatiles emitted from the processed shale pile. Table 2-1, page 2-6 of the Health/ Safety outline should be consulted for further details. Table 2-1 also addresses Polynuclear Aromatic Hydrocarbons.

WRSOC has no reason to believe that volatiles will be emitted from the fines storage pile.

The ambient monitoring program does not address volatile compound emissions under the air program. However, the biological monitoring sections of the ambient program will provide useful information on the impacts from volatiles on the environment. This is the most cost effective means of measuring such impacts given the unknown composition of volatile emissions.

COMMENT:

"Ammonia appears not to be covered in either the proposed Source or Ambient monitoring though it is a by-product of the facility and the potential for fugitive emissions exists."

RESPONSE:

Ammonia will be stored in pressurized bullets and hence the potential for fugitive emissions of ammonia is very small (since the major fugitive emission source would normally be associated with storage tanks). In any event, the supplemental monitoring program in the SMPO does address ammonia emissions. Table 4-4, page 4-25 lists ammonia as an anticipated First-Phase Routine Monitoring parameter for the supplemental program. In addition, the Health/Safety monitoring program addresses ammonia emissions also. See Table 2-1, page 2-6 of the Health/Safety outline for details. Ammonia is not addressed in the ambient program because of the low levels expected to be emitted.

COMMENT:

"It is noted that a 5 year period will pass before initial plant start up in 1989. Although Union Oil Company's Long Ridge plant will be in operation during this time there is no formal requirement for Union to monitor unregulated pollutants. Hence, information on unregulated pollutants from Long Ridge may be somewhat spotty."

RESPONSE:

While the above statement may be true, the SMPO only states that it <u>may</u> be appropriate to re-evaluate the scope of the SMPO as data become available (page 1-9). In any event, WRSOC's program is completely independent of the need for data on unregulated pollutants from Union, since such information will be collected at the WRSP.

COMMENT:

"Paragraph 1.3.1.B Supplemental Monitoring: This paragraph states that as more data become available, WRSOC and WRSP sponsors will revise the supplemental monitoring/program. This should only be done with the concurrence of the Monitoring Review Committee and it's subsequent approval."

RESPONSE:

WRSOC and the WRSP sponsors will revise the supplemental monitoring program only after approvals have been received from all appropriate agencies.

COMMENT:

"The intent of the project sponsors toward supplemental monitoring is stated on page 1-13 as an 'attempt to characterize only those major pollution sources that are likely to have significant quantities of selected pollutants for which regulations have not been developed'.

"How will the significant quantities be determined and who will make the determination? Furthermore, 'only those process and waste streams that come into contact with the environment will be addressed by the supplemental program' (page 4-4).

"These statements make the supplemental monitoring too restrictive. When coupled with the fact that source compliance monitoring is limited to regulated species, the result is that the fate of many unregulated contaminants through environmental control/treatment processes will not be known. As examples, it will not be possible using the proposed approach to learn the fate of organic contaminants through a Unisulf process or the performance of individual water treatment units toward unregulated pollutants. Put another way, it appears that several individual waste streams connected with environmental control units will not be characterized (e.g., Unisulf oxidizer vent and sulfur froth tank vapors, retort feed chute purge gas, and individual water treatment streams. This approach is not consistent with data needs for replicate oil shale plants, especially 'since there is currently no commercial operating experience with this process' (page 4-10)."

RESPONSE:

Page 1-13 of the SMPO has been modified to read as follows: "The supplemental monitoring program for unregulated pollutants will attempt to characterize pollution sources that are likely to have significant quantities of selected pollutants for which regulations have not been developed". As discussed in the SMPO in Section 4.3.1.A (beginning on page 4-17), if the maximum reported concentration of a pollutant determined by the screening analyses exceeds the published minimum acute toxicity effluent (MATE) value, that parameter will be considered for routine monitoring under the First-Phase program. In addition to comparing screening data to MATE's, final selection of parameters will be based upon informed toxicological judgments. All parameter selections for First-Phase monitoring will be discussed with the appropriate agencies before being finalized.

Page 4-7 of the SMPO has also been modified to discuss pollution control system data collection necessary to determine the efficiency of a pollution control unit with regard to the removal of design parameter pollutants. As also discussed, the supplemental program will fully characterize all waste streams that come into contact with the environment. WRSOC does not intend to document the fate of all unregulated contaminants through all environmental control processes. This type of activity is catagorized as "Research and Development" and has no place in the source monitoring program unless the supplemental program detects an unexpected, continuous release to the environment of an unregulated pollutant in significant quantities. In such a case, the SMPO states that the source of such emissions would be determined. For instance, page 4-8 states that the inlet to the flare will be monitored but individual vents that feed the flare will not be monitored unless "a significant problem is detected by the flare

inlet monitoring". Page 4-9 again discusses this same type of philosophy with regard to the reuse waters.

This overall monitoring philosophy is best described on page 4-7 of the SMPO where WRSOC states that: "The supplemental program has been designed to minimize the number of sampling points and still adequately characterize the gaseous, solid and aqueous effluents that come in contact with the environment". Such a philosophy is "consistent with data needs for replicate oil shale plants"; since the performance characteristics of pollution control facilities and the level of pollutants released to the environment are the most important environmental questions relative to the replication of oil shale processing facilities.

In summary, WRSOC does not feel that the supplemental monitoring section of the Environmental Monitoring Plan Outline (EMPO) is too restrictive. The proposed EMPO has been designed to characterize all significant discharges to the environment and to determine the impact, if any, of these discharges on the surrounding ecosystem. WRSOC believes that this approach is consistent with the intent of Section 131(e) of the Energy Security Act (ESA) and with the SFC's Environmental Monitoring Plan guidelines both of which emphasize the characterization of "emissions" to and "impacts" upon human health and the environment. This strongly implies the need to focus our monitoring program on "discharges" to the environment.

COMMENT:

"Paragraph 1.4.6.B states 'Appropriate vapor control facilities will be installed to control hydrocarbon emissions to atmosphere'. Specific methods should be stated and appropriate monitoring schemes given."

RESPONSE:

These types of details are not currently available and are not required for the SMPO. They will be provided in the final plan. Monitoring of vapor control facilities will be conducted using proven sampling techniques applicable to such sources.

COMMENT:

"Paragraph 1.4.6.C Solid Waste Disposal: The non-hazardous waste includes wastewater sludge. Sludge should be characterized so that monitoring requirements can be judged."

RESPONSE:

All process related sludges will be characterized with respect to RCRA criteria as noted on Table 4-3, page 4-4 of the SMPO. WRSOC has removed the words "wastewater sludge" from paragraph 1.4.6.C, page 1-34 and substituted the words "non-hazardous raw water treatment and domestic sewage treatment sludge".

COMMENT:

"Identifying these points (emission release points) on the block flow diagrams would be helpful."

RESPONSE:

WRSOC believes that the current level of process information is not sufficiently detailed to allow meaningful identification of emission points on block flow diagrams at this time. This approach was initially considered by WRSOC in the development of the SMPO, but it was concluded that such a presentation would not realistically represent actual design detail and that the need for general information consistent with SMPO requirements could be best satisfied with a narrative description of the general characteristics of emission points. Specific information will be included in the final source monitoring plan.

COMMENT:

"Pollutants are removed from the mining area by surface-mounted exhaust fans. This section should identify pollution controls and monitoring requirements of the gases before they are exhausted to the atmosphere."

RESPONSE:

Page 3-2 of the SMPO has been modified to discuss the control of pollutants as requested. Baghouses will be installed on appropriate crushing and transfer facilities. Particulates generated by drilling, blasting and mucking will be controlled by wet suppression techniques in the mine. Blasting fumes and diesel exhaust will be diluted to very low levels as a result of the 3,000,000 CFM of ventilation air being circulated through the mine. This is consistent with expected MSHA requirements for the WRSP.

As indicated in Table 4-1, page 4-2 of the SMPO, monitoring of emissions from mine exhausts is not considered to be practical and can best be reflected in the ambient monitoring program results. Also, Table 2-1, page 2-6 of the Health/Safety outline addresses the monitoring of emissions within the mine.

COMMENT:

"Section 3.2 Liquid Emissions: This section is supposed to identify liquid emission release points to the environmental; however, it generally fails to accomplish its objective. For example, potential liquid emission points include leachates to groundwater under the spent shale disposal pile, raw shale feed storage pile and raw shale fines storage pile. Other potential emission points include loss of water through wastewater pond bottoms and discharges from storage reservoirs if the 100 years storm event is exceeded."

RESPONSE:

As described in Section 3.2, the WRSP is being designed for "zero" discharge of wastewater. However, as noted in the EPA comment there may be uncontrolled discharge of leachate to groundwater and overflow of retention ponds under extreme meteorological events. These potential discharges have been added to section 3.2.1, pages 3-10, 3-11 and 3-12 in the SMPO; however, monitoring of such discharges will be accomplished under the ambient hydrology and geohydrology monitoring programs as described in Section 6 of the Ambient Monitoring Plan.

COMMMENT:

"Table 4-2 (page 4-3) indicates compliance monitoring 'as required by zero discharge NPDES permit'. Is monitoring required in a zero discharge permit?"

RESPONSE:

Compliance monitoring in response to requirements of a zero discharge NPDES permit was included in Table 4-2 since at the time the SMPO was submitted a final NPDES permit had not been issued for the WRSP and it was believed that EPA may require monitoring of overflow resulting from meteorological conditions exceeding the 100 year design storm criteria.

Subsequent to submittal of the SMPO, WRSP received a zero discharge permit for the runoff retention pond below the mining and processing plan area. This permit currently stipulates that any discharge resulting from meteorological conditions exceeding the 100 year storm shall not contain process water, and hence, no monitoring requirements were required. Should the NPDES permit be modified in the future to allow for the eventual storage of process-related wastes, then the appropriate monitoring requirements will be included in the source monitoring plan.

COMMENT:

"Table 4-3 (page 4-4) proposes RCRA characterization tests for solid wastes. However, the RCRA extraction procedure may be unreliable in predicting the nature of raw or spent shale leachate. Alternate methods including specially developed column leaching procedures, are better and should be included in the supplemental program."

RESPONSE:

As indicated in Table 4-3, processed shale and non-hazardous process wastes will be characterized under the supplemental program. Footnote 1 on Table 4-3 refers to Tables 4-4 through 4-6 where the details of the supplemental program are listed. Table 4-6 indicates that extracts of solid waste streams will be analyzed for various organic constituents utilizing suggested analytical techniques such as GC/MS. Specific supplemental monitoring analytical techniques will be identified in the final plan.

In addition, page 4-10 of the SMPO indicates runoff/ leachate from the processed shale disposal site will be monitored to fully characterize the composition of these materials.

Testing of coarse raw shale and raw shale leachate was not included in the draft SMPO because it is believed that these will not differ from leachate resulting from the extensive natural exposure of oil shale formations occurring in the region.

RCRA extraction techniques used to characterize solid wastes from the WRSP will be identical to those promulgated as a part of the RCRA regulations. It is not the function of the WRSP sponsors or the WRSOC to develop alternate analytical procedures for use in RCRA determinations.

COMMENT:

"It is not clear how start-up conditions will be evaluated after steady state operation has been achieved. Not enough information is provided to comment on these plans."

RESPONSE:

It appears as though Section 4.1.3 concerning Emergency/Upset Condition monitoring has been misinterpreted. To clarify the purpose of this section, page 4-10 of the SMPO has been modified to read as follows, "Once the plant is commissioned and the process reaches steady state, special monitoring programs will be conducted during subsequent shutdown, start-up and various upset conditions".

Monitoring of start-up conditions is addressed in Section 4.1.3. General supplemental monitoring requirements during emergency and upset conditions are described and sampling frequencies during these events are identified in Table 4-5.

Sampling would be conducted for selected release points and process streams which are determined to be relevant to characterization of the upset condition. As described in Section 4.1.3, there is currently insufficient information available to identify probable upset scenarios and hence, specific monitoring requirements. Specific approaches to identification of monitoring points and frequency of sampling will be developed when system vulnerabilities and upset scenarios are known. Additionally, future permits may require monitoring during upset conditions. It is recognized that not all upset/emergency conditions will be covered by monitoring scenarios and that monitoring such events will be opportunistic in nature.

Data collected during upset conditions will be analyzed and evaluated in comparison to normal operation monitoring data. Because of the generally higher level of emissions resulting from upset/emergency conditions, close coordination between the source and ambient monitoring programs during such occasions will be emphasized.

COMMENT:

"Emissions from storage tanks should be included under supplemental monitoring even though tanks are designed to API and NSPS specifications because data on their use for oil shale does not exist. Cone and floating roof tanks will be inspected to verify proper operation of seals and vents but no monitoring of emissions is mentioned."

RESPONSE:

Routine testing of emissions from storage tanks is not an accepted industry practice. Emissions are based typically upon observed tank conditions, physical dimensions and operation conditions, and empirical equations. An emissions testing program for storage tanks is considered to be "research and development" and thus is not suitable for inclusion in an operational monitoring program. Furthermore, emissions from raw shale oil storage tanks will be minimal due to the low vapor pressure of this material. Upgraded (i.e., hydrotreated) shale oil will be comparible in quality to conventional crude oil. Emissions from crude oil storage tanks have already been well characterized and documented.

In addition, Table 2-1, page 2-6 of the Health/Safety Outline addresses the monitoring of health effects associated with emissions from shale oil operations.

COMMENT:

"The parameter list for gaseous effluents contained in Section 4.3.1 of the SMPO is inadequate since it does not contain non H_2S, sulfur species such as RSH, CS_2, COS, etc. which often are not removed by proposed treatment processes."

RESPONSE:

Table 4-4, page 4-25 of the SMPO does list organic sulfur as an "anticipated" monitoring parameter for the First-Phase Routine Monitoring program. Table 4-1, page 4-2 indicates that the inlet and outlet gas stream for one Unisulf and one tail gas treating unit will be monitored continuously for H_2S and TRS as well as for the parameters contained in the supplemental program. Table 2-1, page 2-6 of the Health/Safety program indicates that area monitoring will be performed for H_2S and gaseous sulfur organic compounds.

Also, it is important to remember that any sulfur species not removed by the Unisulf process should be converted to SO_2 prior to discharge since all Unisulf treated gases are combusted as plant fuel gas. Thus, with the exception of minor fugitive emissions of reduced sulfur species from this source (handled by Health/ Safety Program), this does not actually represent "discharged" source of emissions.

To clarify the intent of the supplemental program, table 4-6, page 4-27 of SMPO has been modified to indicate that organic sulfur will be analyzed using an online GC.

COMMENT:

"Liquids and solids will be sampled using conventional methods (page 4-22). Care must be taken because all conventional methods will not work on oil shale wastewaters."

RESPONSE:

The statement on page 4-23 of the revised SMPO has been clarified as follows: "Liquid and solid samples will be collected using conventional methods". WRSOC understands that conventional analytical methods may not work on oil shale wastewaters. This was acknowledged on page 4-24 of the SMPO as follows, "All analytical techniques will be thoroughly evaluated prior to development of the SMP. Because oil shale wastes may be difficult to analyze, the proposed analytical methods must be tested, as necessary, prior to implementing the monitoring program".

COMMENT:

"WRSOC has proposed the use of MATES (DMEG's) for selection of unregulated species for monitoring (page 4-18). The following points should be taken into account with regard to the use of DMEGs.

"a. The user should make it clear that such values have no utility for risk assessment or determining whether health or other effects concerns may exist. It should also be made clear that such values are being used only as a tool for prioritizing waste streams and pollutants for further analysis and/or determining rough estimates of needed analytical detection limits.

"b. The use of such values without an appropriate overall strategy for phasing or screening is not recommended.

"c. Such values should not be referred to by presently existing terminology or acronyms such as MEG's, DMEG's, AMEG's, etc. However, the exact source of the values used, should be referenced.

"d. If MEG's are used as trigger values, then it should be stated that the values are provided only to be indicative of the approach to be used and should be revised once an up-dated, peer-reviewed methodology is available for determining such values.

"e. Where conditions are suitable and resources are available, use of chemical fractionation in combination with bioassays to identify key pollutants should be considered as an alternative or as a supplemental technique."

RESPONSE:

As stated on page 4-18 of the SMPO, "Unregulated pollutants important for environmental and health reasons have been selected by comparing reported concentrations in various solids, liquids, and gases from other oil shale processes with minimum acute toxicity effluent (MATE) values as reported by the EPA (Mutimedia Environmental Goals for Environmental Assessment, 1977). If the maximum reported concentration in the screening analysis of process waste exceeds the published MATE, that parameter will be considered for routine monitoring under the first-phase program. In addition to comparing data to MATE's, final selection will be based upon informed toxicological judgments".

The above statement describes how WRSOC's source monitoring program will utilize MATE's. WRSOC does not plan to conduct risk assessment, with or without the benefit of MATE's, as part of the source monitoring program. This is not the function of an operational monitoring program. The WRSP source monitoring program will assist in the analysis of project related impacts noted in the ambient (particularly the biological disciplines) and health and safety programs.

WRSOC believes that the SMPO does present an appropriate overall strategy for phasing and screening, and this strategy utilizes MATE's to some extent. Section 4.3 of the SMPO describes our strategy in detail. If EPA feels that this strategy is not appropriate, then we suggest that specific problems with the strategy and alternative approaches be submitted to WRSOC for comment.

The MATE values utilized for the preparation of the SMPO were obtained from EPA Report No. EPA-600/277-136a entitled Multimedia Environmental Goals for Environmental Assessment, Vols. 1 and 2, 1977. This reference is listed in the Bibliography of the SMPO. Any original references to the MATE values (i.e., trigger values) may be found in the above referenced document. WRSOC will consider the use of any EPA published update to the MATE values.

WRSOC does not intend to utilize bioassays as part of the source monitoring program since the validity of results from such analyses are subject to substantial question. Toxicological effects can be neither confirmed nor denied based upon such questionable procedures. Biological effects associated with emissions from the WRSP will be accurately documented as part of the health and safety monitoring program and the biological elements of the ambient program.

COMMENT:

"Table 4-5 (page 4-25) indicates that only 2 samples of exposed materials and only 4 samples of discharged materials will be collected for screening analysis. Two or even four data points are inadequate to establish a Phase II monitoring program."

RESPONSE:

Table 4-5, page 4-26 of the revised SMPO indicates that two composite samples of exposed materials will be taken (i.e., one composite sample during each of two 5-day sampling periods) as part of the "screening" analyses. Also as part of the screening analysis, four composite samples of discharged material will be taken (two composite samples taken during each of two 5-day sampling periods), in addition to quarterly composite samples of discharged materials at all other times during the screening program. The results of the screening analysis will be used to verify the anticipated First-Phase Routine Monitoring parameters listed on Table 4-4 (page 4-25) of the SMPO, and also to add new parameters to the First-Phase Routine program as appropriate. It should be noted that 8-hour composite samples will be taken for most wastes to minimize the variability caused by plant operations and to approximate the exposure received by on-site workers, and to provide large volume weighted samples for analysis.

As indicated on Table 4-5, the First-Phase Routine Monitoring Program for exposed materials will consist of two composite samples taken during two 5-day sampling periods, and quarterly composite samples at all other times. The First-Phase routine analysis for discharged materials will consist of 10 composite samples taken during two 5-day sampling periods, and one composite sample taken bi-monthly at all other times.

As stated on page 4-22, the First-Phase program will be implemented for at least one year. Hence, a minimum of two composite samples of exposed material will be analyzed per the screening program and a minimum of 6 composite samples of exposed materials will be analyzed per the routine monitoring program (i.e., total of 8 composite samples during the first year). In addition, a minimum of 8 composite samples of discharged materials will be analyzed per the screening program and a minimum of 16 composite samples of discharged materials will be analyzed per the routine monitoring program (i.e., total of 24 composite samples of discharged material during the first year).

The results obtained during the first year of monitoring will be utilized to select those parameters (present in concentrations of significant environmental and health concern) which will be routinely monitored for during the Second-Phase monitoring program (see page 4-32). Since the SMPO states that the First-Phase monitoring program will be implemented for at least one year, the monitoring program has the flexibility to increase the number of samples taken during the First-Phase program if it is determined that additional data will be required to adequately define the scope of the Second-Phase program in a statistically significant manner.

It is the opinion of the WRSP sponsors and the WRSOC that the source monitoring program as described by the SMPO will provide adequate data to fully characterize significant project emissions. It is also sufficiently flexible to allow for modifications that the data suggest are necessary.

COMMENT:

"The outline provides a good list of parameters of concern and provides a flexible system to adjust sampling and analysis plans as the project and monitoring program develop."

RESPONSE:

WRSOC and the project sponsors appreciate this comment. The WRSP ambient monitoring program was developed knowing that the process of impact detection would be dynamic and consequently would require a flexible, yet focused, monitoring approach.

COMMENT:

"The sponsor may wish to consider a parallel wild animal/laboratory animal program."

RESPONSE:

The WRSP monitoring program has advanced beyond the usefulness of laboratory-simulated impact detection. We are confident of the current program's ability to quantify project related impacts using a variety of in-situ physical and biological parameters and inter-disciplinary analyses. Parameters have been carefully selected based upon their relationship to impacts, ecological importance, measurability, reproducibility, and cost effectiveness. There is no justification to introduce yet another variable into the program, (i.e., the requirement to explain variations between field and laboratory results).

COMMENT:

"The sponsor should discuss whether there is a need to monitor tremors from blasting and/or overburden fracturing or surface settlement due to mining induced subsidence."

RESPONSE:

As indicated in Section 7.4 of the Ambient Monitoring Plan, subsidence monitoring will be conducted at the WRSP. This is the most direct method to evaluate the long-term impacts associated with blasting, overburden fracturing, etc. More immediate and short-term impacts can be determined from terrestrial fauna monitoring wherein species abundance, diversity, or density may be affected by development activities. Because project-related tremors are expected to be minor, the above mentioned monitoring programs should be sufficient for use in this regard.

COMMENT:

"Post-operational monitoring needs to be addressed."

RESPONSE:

Post-operational monitoring will be required under terms of the Federal Prototype Oil Shale Lease Environmental Stipulations, the State of Utah Mining Permit, and possibly by RCRA should a hazardous waste disposal site be developed at the WRSP. The requirements (i.e., parameters, locations and duration) of such monitoring will be established by appropriate permit conditions and will be included in a final abandonment plan developed for the WRSP. Development of a post-operational monitoring plan at this time is premature.

COMMENT:

"Figure 1.2-1. Input and output should also include groundwater (subsurface) quality."

RESPONSE:

This figure is intended to be a representation of inputs, outputs and interrelationships in the terrestrial environment only. Groundwater (subsurface) quality is not of significance in describing the terrestrial ecosystem at the WRSP. It is of concern in describing the aquatic ecosystem because groundwater from the Birds Nest Zone underlying the WRSP property does discharge into Evacuation Creek and the White River.

COMMENT:

"Subsection 1.7 Glossary - Baseline: How much is significant development activity? Specific information is needed."

RESPONSE:

Baseline conditions at the WRSP have been defined by the ambient monitoring data collected by the project sponsors on and near to Tracts Ua and Ub from September, 1974 to the start of construction on the project which began in May, 1982.

COMMENT:

"Subsection 1.7 Glossary - Contingency Plan: Contingency plans should cover periods of unexpected occurrences, such as accidents, malfunctioning of instruments and equipment failures."

RESPONSE:

Contingency monitoring is instituted whenever increased or specialized sampling or analysis is required to explain the cause of a significant change in the

ambient environment that is not explained by the operational monitoring program. Contingency monitoring is conducted until the likely cause of the change is identified. The logic of this approach is diagramed in Figure 8.3-1 and discussed in Section 8.3 of the ambient monitoring program.

COMMENT:

"Subsection 1.7 Glossary - Critical or Threshold value: This should be a value of an attribute for a criterion, at which point some action becomes necessary such as a change in a decision made earlier."

RESPONSE:

This comment correctly describes how threshold values are used in the WRSP ambient monitoring program. It is the value at which a "statistically" significant change has occurred in the environment. It is a value which, when reached, will trigger additional analysis and/or monitoring in an effort to identify the "cause".

COMMENT:

"Subsection 1.7 Glossary - Monitoring: Monitoring is the measurement of parameters that indicate changes in or impacts on environmental variables."

RESPONSE:

This comment is consistent with the approach to monitoring adopted for the WRSP (i.e., directed at the identification of impacts).

COMMENT:

"Figure 2.1-2. The difference in symbols used for measurements included in the current program and in symbols used for measurements to be added to the program is not clear."

RESPONSE:

The elements of our current monitoring program are shown in the boxes bordered by heavy black lines on Figure 2.1-2. Other information included on the figure shows how additional monitoring would be phased-in for the WRSP. This is also explained in Table 2.1-1. The contents of the air monitoring program have been fully coordinated with and approved by the Bureau of Land Management - Oil Shale Projects Office following consultation with the Oil Shale Environmental Advisory Panel.

COMMENT:

"Page 2-17 - Site S4: The possibility of public objection to the moving of Ignatio Stage Stop may have to be examined further."

RESPONSE:

The Ignatio Stage Stop was located on private lands north of the WRSP. In May, 1982 the WRSOC funded the relocation of one building to Bonanza, Utah, which was necessary since Uintah County was upgrading an existing roadway. The BLM participated in the relocation by conducting an archeological investigation of the site during and subsequent to the move. WRSOC was under no obligation concerning Ignatio but believed it would be of historical value to preserve at least part of the facility. No public objection was raised concerning the move or the subsequent road work.

COMMENT:

"Subsection 2.5 Contingency Plan: It may be appropriate to include monitoring procedures during unexpected occurrences such as accidents, fires and equipment or power failures."

RESPONSE:

The WRSP air monitoring program will involve continuous analyses of air quality at a number of sites surrounding the processing plant and processed shale disposal area. During periods of unexpected occurrences (i.e., upsets), data from the ambient program will be coordinated with data collected by the source program to track the movement of pollutants from the project. No special or contingency monitoring will be implemented unless an unexplained impact is detected.

In the event that conditions which cause the plant upset also cause the air monitoring system to malfunction, every effort will be made to reactivate the system as soon as possible. It is important to note that while the monitoring of certain physical parameters may be disrupted during such an event, the biological monitoring program would continue to provide valuable information concerning the impacts of the upset condition.

COMMENT:

"Subsection 5.1.1. Identification of Potential Impacts: The possibility of offensive odor should be stated."

RESPONSE:

Odor from WRSP operations is not expected to be a significant potential cause of adverse impact on terrestrial fauna.

COMMENT:

"Pages 5-16, 17 and 23. On these three pages 1982 studies are referred to as if not yet done, but this is a 1983 document. If these studies are completed, results should be presented or the performance period should be changed."

RESPONSE:

The parameters for which 1982 monitoring dates are given were in the "potential" catagory. Subsequent to the 1982/83 monitoring programs, raptors and threatened and endangered species monitoring have been moved from potential to operational monitoring parameters. Also, soil invertebrate sampling has been moved from a potential to a contingency monitoring parameter. These changes, which are adequately supported by data collected during 1982 and 1983, have been discussed with the BLM-Oil Shale Projects Office.

COMMENT:

"Page 5-24. Chemical Uptake: The statement 'The chemical uptake of small mammals and invertebrates will be done by an independent laboratory using appropriate techniques' does not give any information about their analysis. The statement needs to be more specific."

RESPONSE:

Chemical uptake in terrestrial fauna is listed as a "contingency" parameter. It is planned to establish a baseline for this parameter prior to the initiation of retorting at the WRSP. Deer mice and grasshoppers are the principal candidate species for the measurement of chemical uptake. An effort will be made to reduce, to an acceptable level, the natural variability of this parameter by establishing a relationship between chemical uptake in terrestrial fauna and in vegetation samples collected from common locations. Analytical procedures will involve standard methods for the isolation of trace elements in whole body (invertebrate) or organ/bone (rodent) samples.

COMMENT:

"Page 5-26. Materials needed for waterfowl and raptors should include safety equipment."

RESPONSE:

Safety is a number one concern in the development of the WRSP. As in all programs associated with the WRSP, the terrestrial fauna monitoring program is operated by trained professionals who are thoroughly aware of and practice appropriate safety procedures in the conduct of their field and laboratory work.

COMMENT:

"Subsection 6.4.4. Computer Analysis/Simulation: This paragraph does not discuss simulation."

RESPONSE:

This comment is correct. This subsection does not address simulation but rather is limited to a discussion of the types of computer programs which would be conducted to analyze the water resource data. Simulation modeling could be conducted as a contingency effort to assist in the explanation of an observed impact or the identification of a potential impact, if warranted.

COMMENT:

"Subsection 6.5.2. Contingency Monitoring in the event that a trigger value is exceeded: Several steps are mentioned to establish the need for contingency monitoring. Time elapsed between the point when the trigger value is exceeded and the contingency monitoring is implemented may be important and should be stated."

RESPONSE:

The WRSP monitoring program will increasingly seek to work in "real time" to the extent possible. This effort will minimize the time between sampling, completion of analysis, and implementation of action. Contingency analysis using other intra- and interdisciplinary data will be triggered immediately upon the detection of a statistically significant change in the environment. Contingency monitoring will be triggered if available data fails to identify the cause of the change. It is not possible to establish how much time will be required to complete this process, although every effort will be made to minimize the time necessary for "cause and effect" analysis which will lead to appropriate action.

COMMENT:

"Page 6-56. In the event that a null hypothesis is rejected: A statement of general null hypothesis at this point will make the description clearer."

RESPONSE:

As requested by this comment, a general null hypothesis can be stated as follows, "there is no difference between the values being measured for parameter X and the associated trigger value for Parameter X". Alternately a null hypothesis might also conclude; "there is no difference between baseline (i.e., preconstruction) values of Parameter X and values of Parameter X measured by the operation or post-operation monitoring program". The second hypothesis suggests a temporal comparison of data. Likewise, spatial comparisons (i.e., control vs. treatment design) may also be appropriate.

COMMENT:

"Page 5-65. Precipitation: Provisions for measuring the pH value of precipitation may be advisable for the base case as well as after the project is in operation."

RESPONSE:

The pH of precipitation was evaluated during the Baseline program in 1975 and was initiated again during 1983. It is planned to continue measurement of this parameter during operation of the WRSP. Sampling is being conducted at our A-4 air monitoring station. Data on the path of an accompanying storm front, if appropriate, is also collected to assist in the analysis of the precipitation pH data.

COMMENT:

"Page 7-4. Objectives: The statement that mitigation measurements will be determined and modification to the process design made for compounds causing adverse and irreversible damage may also be necessary for compounds causing adverse but reversible damage."

RESPONSE:

The identification and mitigation of adverse and irreversible damage through either design or operational changes is an important goal of the WRSP monitoring programs. However, the mitigation of reversible damages may not require immediate project operation changes depending upon the nature and extent of the damage. The WRSP will seek to minimize its impacts on the environment as the project develops but cannot be expected to mitigate immediately any identified adverse, yet reversible impact (i.e., the temporary dislocation of wildlife species from disturbed areas). Decisions in this regard will focus on the magnitude and duration of the expected problem (i.e., immediate or long-term health issues involved), regulatory requirements, and the cost effectiveness of immediate mitigation.

COMMENT:

"Page 7-5. Hazardous Waste Monitoring: More information about the waste site is needed. This information should include the type of lining proposed, life of the landfill, monitoring and maintenance requirements, and responsibility to maintain and monitor it after the operational life of the WRSOC shale oil plant is over."

RESPONSE:

Section 7 of the ambient monitoring program addresses several special studies anticipated to be necessary for the WRSP. Hazardous waste monitoring, as discussed in Subsection 7.5 at page 7-30, addresses the "probable" monitoring requirements to be imposed on the WRSP in the event that a hazardous waste disposal site is established at the WRSP. No final decisions have been made regarding the method of disposing of the project's hazardous waste. Consequently the information concerning the site, lining, duration and monitoring of the facility have not been developed. This information and a definitive monitoring program will be developed as a part of a RCRA permit application, should this be required.

Form 1279–3
(June 1984)

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